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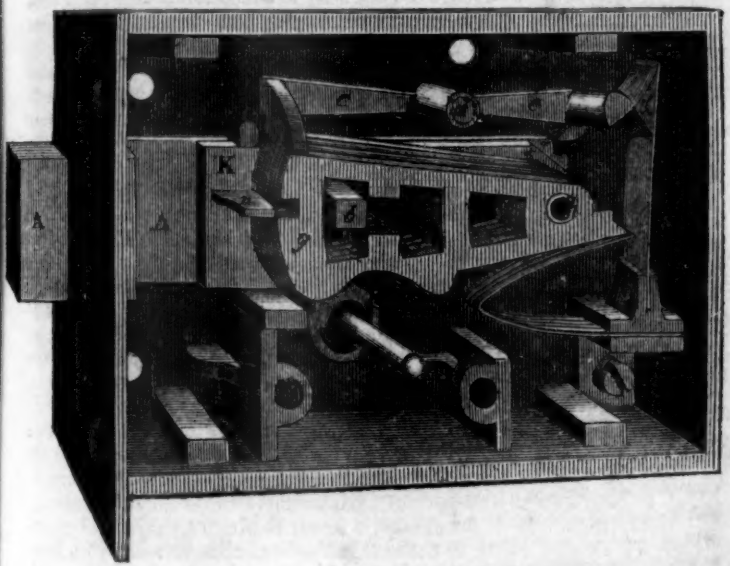
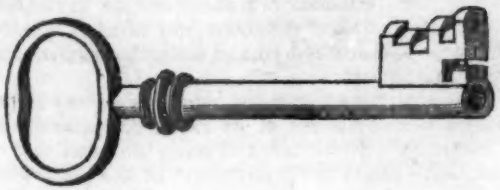
OCTOBER, 1826.

CHUBB'S PATENT DETECTOR LOCK.





Description of the Detector Lock.

The preceding drawing will give our readers a full insight into the peculiarities of Chubb's celebrated Detector Lock. A A *a*, the bolt; *b*, the square pin of the bolt; *c c*, the detector moving on the centre *d*; *f*, the detector spring; *g*, four tumblers moving separately on the centre *h*, shown lifted by the key to the exact position, for the square pin *b* of the bolt to pass in unlocking. Should one or more of the tumblers be lifted by a pick, or false key, in the least degree beyond their present position, the detector *c c*, being thus over-lifted, will, by the angle of the spring *f* pressing on the opposite side of the angle of the detector, force its hook into the notch of *a* the bolt, and be firmly held so, until disengaged by the regulating slide K *k*; in which case, by the introduction of the key, the tumblers are lifted to the *regulating combination*, and admit the stud *n*, affixed to the regulating slide, to enter the several grooves in the ends of them; the beveled end *k* of this slide, by the same movement, pressing against the hook of the detector, disengages it from the notch *a* of the bolt.

The merits of this lock, as stated by the ingenious inventor, are, that it possesses, in a much higher degree than any other, the four principal requisites of a good lock; viz. security, simplicity, strength, and durability. Its security is increased beyond calculation, by an improvement which not only renders it impossible to be picked or opened by *any* false instruments, but also *detects the first attempt* to open it; thereby preventing those *repeated efforts*, to which even the best locks hitherto invented are exposed. The instant that one or more of the tumblers are lifted beyond the place where the bolt is at liberty to pass, it overlifts the detector, which then hooks the tail of the bolt, prevents it from passing, and thus gives incalculable additional security (as well as immediate notice, the first time the true key is put into it to open it, that an attempt has been made to pick it,) and renders all farther attempts useless, it being *impossible* to discover the *first* combination, in order to disengage the detector, or the *second*, in order to remove the bolt. Nothing, in short, but the true key can either release the Detector from its grasp on the bolt, or open the Lock.

The simplicity of its construction, and strength of its parts, are such, that no false key or other instrument, introduced into it, for the purpose of opening it, can (without very great violence) injure it. The keys are *small* and portable, particularly those for iron doors.

With respect to its durability, it is not liable to be injured by constant use in any length of time; this has been ascertained by an iron-rim lock having been attached to a steam-engine in the dock yard, Portsmouth, (to try the effect of friction,) by which it was locked and unlocked upwards of four hundred and sixty thousand times, without receiving the least injury.

Mr. Chubb having, by order of the honourable Navy Board, lately supplied a considerable number of his Patent Detector Locks for the use of the Portsmouth dock-yard, and being informed that there was a convict on board one of the prison ships at this port, who was no-

torious for picking locks (being by profession a lock maker, and who has, till recently, for several years been chiefly employed in picking and repairing locks in London,) Mr. C. requested the favour of Commissioner the Honourable Sir George Grey to send for this man, that he might exercise his skill in attempting to pick his lock; and the Commissioner having been pleased to acquiesce in this request, the man was sent for accordingly, and one of Chubb's Patent Locks was submitted to his inspection, at the Storekeeper's office, in the presence of several of the principal officers; when, after a careful examination, he said, "he thought he could pick or open it with false instruments." He was therefore furnished with files, and all the tools he stated to be necessary to prepare the instruments for his purpose; and was directed to give notice to the storekeeper when he should be ready to make the trial, for the promotion of which, a reward of five pounds was promised him if he succeeded. In about three weeks after this time, he sent to say that he was ready; and a time being fixed for the purpose, he commenced his operations in endeavouring to pick one of the locks, in the presence of the principal officers of the dock-yard; but he could not succeed. He then stated, "that his failure was in consequence of his instruments not exactly fitting the lock." To remove this impediment, the Patentee offered to supply him with some blank keys, which should fit two of the locks, in order to his making another trial; these were furnished accordingly, together with a lock exactly the same in principle and in kind as those he had been trying, so that he might examine its construction, and make himself master of its principle. Shortly after, he made another attempt to pick two of the locks, in the presence of the honourable Sir George Grey, and the principal officers of the dock-yard; his success in this attempt was not better than the first; but he overlifted the detector of each lock. Sir George Grey then asked him what he would do in this case, supposing he had been making an attempt on such a lock, with an intent to commit a robbery? He said, "I would go no more to the lock; they would set a watch, and catch me." He still thought, however, that by a further alteration of the instruments, he could yet succeed; more time was therefore given, and every facility afforded him. Some time afterwards he again repeated his efforts in the presence of the same gentlemen; but having, in his previous experiments, overlifted the detectors, he could not by any means disengage them; this was done for him several times with the keys belonging to the locks; but, as often as they were regulated, on every successive trial he overlifted them again; till at last he gave it up, saying, "that he had used his utmost ability in his repeated attempts, and could not succeed: that these locks were the most secure he had ever met with, and that he did not think it possible for any man to pick or open them with any false instruments whatever." [*London Mechanic's Magazine.*

On the Mineral History of Gold, and the separation of it from Earthy and Stony Bodies, by Water, Mercury, &c. By the late WILLIAM LEWIS, M. D.

(Continued from page 171.)

On the separation of Gold from Earthy and Stony Bodies, by Water.

Gold, intermixed with earthy bodies, in small particles or dust, is separated by washing with water, which carries off the lighter earth, and leaves the more ponderous metal behind: the great gravity of gold, renders it better adapted to this way of separation, than any of the other metals. There are sundry variations in the manner of conducting the process, according to the quantity of the matter, the nature of the earthy body, and the conveniency of the place; many of which are minutely described by Agricola, in his treatise *de re metallica*. It will be sufficient here, to give a general idea of the manner of procedure, in an operation merely mechanical, and whose success depends chiefly on manual dexterity, acquired by practice.

Where the quantity of matter is small, it is laid, by a little at a time, in a round, shallow dish, called a buddle; or in an oblong vessel, like a boat; which being gently shaken backwards and forwards in a tub of water, the lighter part of the earth is taken up, and washed off, leaving with the gold such sand, or small stones, as the mixture contained. By dexterously repeating the agitation, that the whole may acquire, as it were, a kind of fluidity, the metalline particles sink to the bottom, and the sand or stones are thrown up to the top, and may be removed by the hand.

At several of the gold mines of the Spanish West Indies, the gold is completely separated by this simple operation. According to Don Ulloa's account, in his voyage to those parts, the earth, as it comes from the mine, is thrown into a reservoir, a stream of water conducted upon it, the whole stirred together, and the muddy water let off into another and another reservoir; and what it deposits in the others, is taken up in trays or buckets with two handles, and agitated in fresh waters, with a uniform circular motion, till the gold is collected at the bottom.

M. de Reaumur, in the French memoirs for the year 1718, gives a particular description of the method of washing the gold sands of the Rhine, and some other rivers. A board, five feet long, a foot and a half wide, with a ledge at each side, and at one end, is laid aslope, with this last end on the ground, and the other raised a foot and a half: across the board are nailed three pieces of rough cloth, each about a foot wide, and at distances of a foot; and at the upper end is placed a kind of basket, made of rods. The sand is shovelled into the basket; water thrown on it washes the sand through, the stones remaining: the earth, and lighter parts of the sand, are carried down to the bottom of the board, while the particles of gold, and the heavy black and red sands, already mentioned, are detained by the rough cloths; which, when they appear covered, so as not to be able to detain more,

are taken off, and washed in a tub of water, then nailed on again, and the process continued, till a proper quantity of this richer sand is obtained. In some places, instead of the cloths, skins, with the hair or wool on, are used; and in others, notches are made across the board. The richer sand, thus detained, is put into a vessel somewhat like a boat, which is gently shaken in water, in the same manner as the sieve in winnowing corn, till the lighter grains rise to the top: these being carefully poured off with the water, the agitation is repeated, so long as any grains, of a different colour from the rest, are found to rise. No further separation is to be expected by this method; and the gold, of which some particles begin now to be distinguishable by the eye, is extracted from the remaining matter by mercury, as will be described in the following article.

Gold, bedded in stones, may frequently be separated from great part of the stony matter, on the same principle; the stone being previously reduced to powder. In the large way, it is beaten in mills, under water, by large wooden stampers, armed at the bottom with iron; an iron grating being commonly fixed at one side of the trough, or pit, through which the finer parts are continually washed off by the water. When a little quantity is to be powdered in a mortar, it should likewise be done *by blows of the pestle, not by grinding: a blow only flattens the metalline particles, while triture wears and divides them, in part, to such tenuity, as not freely to subside in water.* Stones of the hard flinty kind are previously made red-hot, and quenched in water; by which means, they are rendered more easily pulverable; and, at the same time, many of the small particles of gold, melting in the fire, unite, and form large masses.

On the separation of Gold from Earths and Stones, by Mercury.

Where the minuteness of the particles of gold, and the weight of the matter with which they are intermixed, render them inseparable by water, quicksilver is called in aid for imbibing and detaining the gold. The gold sands, freed by water, as in the foregoing article, from as much of the lighter matter as can be washed off by water, without endangering a great loss of the gold, are dried, and a small proportion, less than a hundredth part of their weight, of mercury poured on them: the whole is well kneaded up together, that the mercury may penetrate as much as possible into all the interstices between the grains; it imbibes the atoms of gold it meets with, and the sand is afterwards washed off by water.

In the Spanish West Indies, at those mines where the gold is imbedded in stones, and requires quicksilver for its separation, the stony matter is reduced to as fine powder as possible, that every atom of the gold may be laid open to the mercury. The powder is soaked, for some time, in a solution of common salt; the mercury squeezed out through a linen cloth, so as to fall like dew all over the surface of the cloth: and the mixture being well stirred and kneaded, a gentle heat is applied, by which the activity of the mercury is so far increased, that the incorporation of the gold with it, which, in

the cold, requires about thirty days, is said by J. Hernandez, in an essay on these mines, to be effected by this method in five or six days.

Alonso Barba, in the third book of his Art of Metals, describes another method, which, he says, he has practised with great advantage: he puts the powder, with a suitable quantity of mercury and water, into a deep copper vessel, fixed in a furnace, and applies a fire sufficient to keep the water boiling; a small wooden mill assists the ebullition of the water, in giving motion to the earthy powder, which, continually rising and falling down again, is brought into frequent contact with the mercury at the bottom, so as to give out its gold to the mercury in as many hours as the common process, without heat, requires days.

When the gold is judged to be united with the mercury, the earthy powder is washed off by water, so as to leave the amalgam clean. Where the mercury has been kneaded up with the powder, a considerable part of it is always divided into such minute globules, as to be washed away along with the earth; an inconvenience, which, in the other method, does not happen, or in a far less degree.

On the separation of Gold from the sweepings of Goldsmiths' and Jewellers' Shops.

The gold dust, or filings, dispersed through the sweepings of the goldsmiths' shops, are recovered by amalgamation with mercury. Two broad iron bars, rounded at their ends, placed cross-wise, and fixed on an upright axis, are made to turn, by a handle at the top of the axis, on an iron plate fitted into the bottom of a tub.* The sweepings being put into the tub with a quantity of mercury and water, the powder passing successively under the iron bars, is ground, and brought into contact with the quicksilver, which by degrees extracts the gold; while the water, which, after a certain time, is suffered to run off through a small quill, fixed in a hole made in the side of the tub, carries with it the lighter earthy matter:† fresh water is supplied, till all the earth is thus washed off. The operation might,

* Three of these mills are now used together, a bar of wood with holes made through it, which receive the three handles into them, giving motion to all the three mills, which are placed in a straight line, at once. The late Mr. Nicholas Paul informed the Editor, that a mill was established at Geneva, for washing the goldsmiths' and jewellers' sweepings, *gratis*. It consisted of a flat circular ring of cast-iron, placed horizontally, and having a circular groove or channel, in which two heavy cast-iron runners were made to turn by the power of horses. The sweepings being put into the channel with mercury, water was made to enter the channel on one side, and pass off on the other side, continually, during the action of the machine. We said the proprietors professed to grind the sweepings *gratis;* but, in fact, the water carried off with it into proper receptacles, placed in an adjoining room, so much gold, as to render the concern *a highly lucrative one.* If we are not mistaken, a similar machine is, or at least was, established by foreigners in London, some time since.—*Editor Tech. Rep.*

† And possibly some of the gold also; see the foregoing note.—*Editor T. R.*

doubtless, be expedited by the use of heat, as in the above process of Barba.

The gold being by these means transferred into the mercury, and the mixture washed clean, as much as may be of the mercury, is pressed out through leather, and the remainder forced off by fire. To collect the exhaling mercury, a head and receiver are fitted to the iron pot, in which the mass is exposed to the fire. Barba advises the pot to be lined with a mixture of clay and sand, to prevent the gold from adhering to, or dissolving a part of, the iron, in case the fire should be raised so far as to make the gold melt.*

It is scarcely to be expected, that the greatest address of the workmen can collect, either by water or mercury, the whole of the gold diffused through a large quantity of other matter, at least when the mercury is used, as it is in the large way, in so small a proportion as a 100th or 200th part of the weight of the earthy powder. Reaumur, after having worked some gold-sand with mercury, in the methods commonly practised by those who wash the sands of rivers, obtained from the remaining sand, by treating it with a double quantity of mercury, near as much gold as he had done the first time.

On the extraction of Gold, intimately combined in the composition of Sands.

For extracting gold from the ferruginous sands, mentioned in the preceding part of this article, the sand is to be made red-hot, and quenched in water, and the ignition and extinction repeated four times, or oftener. The colour changes from yellow, red, or black, to a reddish brown. In the first and second heating, the sand yields a slight smell, somewhat like that of garlic, a mark of its containing arsenic: at the third time, the arsenical smell is scarcely to be perceived; but on throwing into the crucible a little tallow, or other like inflammable matter, it becomes stronger than before: this remarkable circumstance is by no means peculiar to these sands, for there are several arsenical minerals, which give little of their arsenic in the fire, till some inflammable matter is added. The sand, thus calcined, is mixed with twice its weight of granulated lead, and equal its weight of black flux; the mixture put into a crucible, and covered with some sea-salt, dried over the fire until it has ceased to crackle. The crucible is placed in a good blast-furnace, the fire strongly excited, and the matter stirred from time to time with an iron rod: the fire must be urged till the scoria flows thin as water, which is known by the rod coming out almost clean, without the least knob sticking to the end of it. The crucible is then suffered to cool, and broken, for getting out its contents: on the top is the common salt, in a distinct cake; under this, a shining, black, compact, vitreous scoria; and at the bottom, a lump of lead, easily separable from the scoria. The gold contained in the sand, is now transferred into the lead, and may be separated by working off the lead upon a cupel or test. These

* This advice of Barba is adopted in the Royal Mint, in the *cast-iron crucibles* used for melting gold and silver in, with great economy.—*Editor T. R.*

sands contain also silver, which here accompanies the gold, and which may be parted after the cupellation, either by *aqua-fortis* or *aqua-regia*, according as the one or the other metal appears to prevail in the mass. This is the process followed by M. Lieberecht, in the assays already given an account of.

As the black flux (which consists of one part of nitre, and two or three of tartar, mixed together, and burnt in a covered vessel to a black alkaline coal,) is apparently too expensive to be employed for any considerable quantities of the mineral, its place may be supplied by a mixture of potash, or other fixed alkaline salts, with powdered charcoal. Four parts of potash, three of charcoal, and thirty-two of lead, are sufficient for sixteen of the calcined sand. This mixture, as Hellot observes, requires the fire to be continued longer than the preceding, to make the matter equally fluid, but when it is made so, the yield is found to be in both cases alike.

The same end may be obtained also, by boiling the calcined sand in melted lead, without any inflammable or saline addition. For the vitreous matter, into which the lead is gradually converted, will dissolve the earth, and the unvitrefied part of the lead will receive and collect the gold; but a much larger quantity of lead is requisite in this than in the other ways.

In all the foregoing methods, though the quantity of gold obtained is considerable, much still remains in the scoriæ, for want, probably, of a thorough commixture of them with the lead: for whatever degree of fluidity the scoriæ are brought to, the particles of gold are too minute to subside by their own weight, and the lead can collect them only from those parts which it comes in contact with. It may, therefore, be presumed, that the separation will be the more complete, as the commixture of the lead is the more perfect. Lead cannot be mixed perfectly with sands, but in a vitreous or semi-vitreous form. By grinding the calcined sand with litharge, or other calces of lead, and exposing the mixture to a moderately strong fire, they may be intimately united into a uniform glassy compound, the sand being dissolved by the vitrefied lead, nearly as salt is dissolved by water. On adding to this compound, a little powdered charcoal, or barely stirring it with an iron rod, the lead revives, and falls to the bottom; and as the sand has there been in contact with every part of it, the gold will probably be extracted from every part, at least, more effectually than by the other methods. In this way, it will be proper to mix some alkaline salt with the litharge and sand; partly to promote the dissolution of such portion of the sand as floats on the top of the ponderous metallic preparation, and partly to continue the fluidity of the scoria, after the revival of the lead. The crucible may be made of Stourbridge clay, which seems to be one of the best of the common materials for resisting glass of lead in fusion. It appears to have been on a process of this kind, that Becher's proposition to the States of Holland was founded, for extracting gold with profit from common sands; it is plain, from his account of the affair, in his *minera arenaria*, that he vitrefied the sand with glass of lead, or litharge; and he expressly mentions in one place, the precipitation of the lead from the

glass by iron: he used also an addition of silver in great proportion, for imbibing the gold, and thus required a vast capital for establishing a work in large; but where the lead is to be revived, the silver is rather detrimental than useful; for the gold and silver contained in the sand are imbibed by the lead, and the additional silver occasions an enormous expense of *aqua-fortis* for dissolving it, in order to the separation of the gold. Whether, with this reduction of the expense, of which Becher himself seems to have had some idea, the process might be practicable to advantage, or whether some earthy bodies might not be a useful auxiliary for promoting the fusion of the gold sands, may deserve further inquiry: one kind of earth is frequently observed to bring another into fusion, though both are of themselves unfusible; and the earthy parts of different ores are made fluid in the furnace of the smelter, by the addition of other earths.

On the extraction of Gold from the Ores of other Metals.

When gold is intimately combined with other metals in their ores, the ore is to be run down in the same manner as the same kind of ore without gold. The gold commonly melts out with the proper metal of the ore, from which it may be afterwards separated by different processes, according to the nature of the metal. There are grounds to believe, that most metalline bodies, as extracted from their ores, contain generally a portion of gold, though rarely sufficient to bear the expenses of its separation.

Zinc, arsenic, and mercury, are obtained from their ores by a kind of sublimation: hence, if the ores of these contain gold, the gold is to be sought for, not in the metallic substance separated, but in the remaining matter. There are some other cases also, in which the gold, instead of accompanying the metal in its fusion, is thrown off in the slag: but the ores and slags of this kingdom have been so seldom examined for gold, that I can say but little satisfactory on this subject.

ON ENGRAVING.

(From the Mechanics' Gallery. By C. F. Partington.)

(Continued from p. 165.)

Engraving in Mezzotinto.

Notwithstanding the great difference in the works of the *mezzotinto* engravers, their operations are nearly the same. The plate must be prepared and polished in the same manner as for other work; and afterwards divided equally by lines parallel to each other, which are to be traced out with very soft chalk. The distance of these lines should be about one-third of the length of the face of the cradle, or grounding tool, which is to be used; and they should also be marked with capital letters, or strokes of the chalk to distinguish them from one another. The cradle is then to be placed exactly betwixt the two first lines, and passed forwards in the same direction with them, being held as steady as possible, and pressed upon with a moderate

force, rocking it from end to end, till it has completely hacked all that part of the plate between those two lines. The same operation must be repeated with respect to all the other lines, till the instrument has passed over the whole surface of the plate, and rendered it uniformly rough throughout. Other lines must be then drawn from the extremities of the other two sides, in the same manner, and at the same distance from each other, as the first set of lines; these lines intersecting the first at right angles, will, with them, form squares. The same operation must be repeated with the cradle, between this second course of lines, as in the case of the first. New lines must then again be drawn diagonally to the former, and, bisecting the aforesaid squares, and the cradle passed betwixt them as before: when the first diagonal operation is performed, the diagonal lines must be crossed at right angles by other lines, as the former, and the cradle passed betwixt them in the same manner. The plate having undergone the action of the cradle, according to the disposition of the first order of lines, as above, a second set of lines must be formed, having the same distances from each other as the first. But they must be so placed as to divide those already made, into spaces one-third less than their whole width; *i. e.* every one, after the first on each side, will take in one-third of that before it; *e g* beginning at A, of which the first third must be left out; a third of B will consequently be taken in, and so of the rest. These lines of the second order must be marked with small letters, or lesser strokes, to distinguish them from the first: and another ground must be laid on the plate, by hacking it with the grounding-tool, between each two of the second order of lines. When this second operation is finished, a third order of lines must be made; the first of which, *e g* in A, must omit two-thirds of it, and consequently take in two-thirds of B, &c. By these means the original spaces will be exactly divided into equal thirds; and the cradle must be again employed betwixt these lines as before. When the whole of this operation is finished, it is called *one turn;* but, in order to produce a very dark and uniform ground, the plate must undergo the repetition of all these several operations for above twenty times; beginning to pass the cradle again betwixt the first lines, and proceeding in the same manner through all the rest. The plate being thus prepared with a proper ground, the sketch of the design, or outline, must be chalked on it, by rubbing the back of the paper, or drawing with chalk, and tracing the outline with a pointer, as in etching. It is also proper to overtrace it afterwards with black lead or Indian ink, to have a more distinct and permanent sketch. The scraping is then performed by pairing or scraping away the grain of the ground in various degrees, so that none of it is left in the original state, except in the touches of the strongest shade. The general method of proceeding is similar to that of drawing with white, upon black paper. The masses of the strongest light are first begun with, and scraped pretty smooth; and some parts, where there is no shade, as the tip of the nose, &c. are burnished, and those parts which go off into light in their upper part, but are brown below. The next lower gradations of shade are then scraped down, after which the reflected lights are entered upon: the

plate is next to be blackened with a printer's blacking ball, made of felt, in order to discover the effect: and then the work is proceeded with again, observing always to begin every part in the places where the strongest lights are to be introduced.

J. C. Le Blon, of Frankfort, pupil of Carlo Marata, applied this art to the method of printing with different colours, to produce the resemblance of paintings. He considered all colours as composed of three primitive ones: the combination of two of these, he asserted would produce a third, such as their compound must necessarily give, and the two primitive colours would preserve their original colour: but if transparent colours be mixed, and three primitive ones combined together, they destroy each other, and produce a black, or a colour approaching towards it, in proportion to the equality or inequality of the mixture: and if these three colours be laid either separately, or upon each other, by three plates, engraved correspondently, on these principles, to the colouring of the design, the whole variety of tints necessary may be produced. The requisites, therefore, to the execution of any design in this method of printing are the following:—1. To settle a plan for the colouring to be imitated, showing where the presence of each of the three simple colours is necessary, either in its pure state, or combined with some other, to produce the effect required; and to reduce this plan to a painted sketch of each, in which not only the proper outlines, but the degree of strength should be expressed. 2. To engrave three plates, according to this plan, which may print each of the colours exactly in the places where, and in the proportion in which they are wanted. 3. To find three transparent substances proper for printing with these three primitive colours. The manner in which M. Le Blon prepared the plate was as follows:—The three plates of copper were first well fitted, with respect to size and figure, to each other, and grounded in the same manner as those designed for mezzotinto prints: and the exact place and boundary of each of the three primitive colours, conformably to the design, were sketched out on three papers, answering in dimensions to the plate. These sketches were then chalked on the plates; and all the parts of each plate, that were not to convey the colour to which it was appropriated to the print, were entirely scraped away, as in forming the lights of all mezzotinto prints. The parts that were to convey the colours were then worked upon, and where the most light or diluted tints of the colour were to be placed, the grain in the ground was proportionally taken off; but where the full colour was required it was left entire. In this method of printing regard was had not only to the effects of the colour in its simple state, but to its combined operation, either in producing orange colour, green, or purple, by its admixture with one alone; and likewise to its forming brown, gray, and shades of different degrees, by its co-operation with both the others. But though the greatest part of the engraving was performed in the mezzotinto manner, yet the graver was employed occasionally for strengthening the shades, and for correcting the outline, where it required great accuracy and steadiness. It was found necessary, sometimes, to have two separate plates for printing the same colour,

in order to produce a stronger effect: but the second plate, which was used to print upon the first, was intended only to glaze and soften the colours in particular parts that might require it. With respect to the black and brown tints, which could not be so conveniently produced, in a due degree, by the mixture of the colours, umber and black were likewise used. From some specimens of this invention, left us by the above artist, and cotemporary accounts of his success, we have reason to believe he met with less impediments in his work than many of his successors; but with respect to the order in which the plates are to be applied, it may be proper to observe, that the colour which is least apparent in the picture should be laid on first; that which is betwixt the most, and least apparent, the next; and that which predominates, last; except where there may be occasion for two plates for the same colour, as was before mentioned; or where there are any more plates required for adding browns and shades.

The above-named ingenious artist, applied this art not only to general subjects, but also to portraits, and showed, by the specimens he produced, the possibility of its being, by further improvements, rendered capable of affording very exact imitations of painting, which might have some value. It must, however, be confessed, that it is much better adapted to the simpler subjects, where the colours are less compounded and intermixed, and where the accuracy of the reflections and demi-tints do not form an essential characteristic; and, in general, it may be observed, that those mezzotints which have their outlines finished with the graver are better adapted to this mode of painting than plates wrought with the scraper and burnisher only. M. Cochin observes, that "though Le Blon confined his method principally to the use of three colours, yet, should this invention be again taken up and cultivated, there would be more probability of success in using a greater variety: and that several different kinds might be printed by one plate, provided they were laid on in their respective proper places by printing-balls, which should be used for that colour only.

(TO BE CONTINUED.)

Progress of manufactures and other improvements in New Hampshire.

PORTSMOUTH, N. H. Aug. 19.

In 1810 there were in New Hampshire but 12 manufacturing establishments, with 5956 spindles; and the whole amount of woolen, cotton, flaxen and tow cloth manufactured by them, and by families throughout the state in that year, was only 4,274,185 yards. There are now in this state more than *fifty* cotton and woolen factories, and the amount of cloth manufactured annually, cannot be far from 30,000,000 yards. Some of the towns in the vicinity of Portsmouth have within a few years been wonderfully changed from agricultural to manufacturing pursuits. The factory establishments of Newmarket, Dover, Somersworth, Berwick, &c. have made our neighbourhood a

manufacturing district, and the future good or bad effects of this pursuit, must in time have a great influence upon our prosperity.

In 1822, that part of Somersworth called Great Falls, contained but *two* dwelling houses. Now the eyes of the visiter are greeted with a pleasantly situated, and beautiful village, of between sixty and seventy buildings, chiefly erected within the last two years, either built of brick, or painted, and many of them of the same size and appearance, laid out with so much regularity, that if exhibited in a picture, it would partake too much of formality to appear natural. This is exclusively a manufacturing village—nothing is to be seen but what has some relation to the establishment.

Here are four factories—one for cotton, built of wood, 5 stories (including basement and attic,) 35 feet wide and 65 feet long, containing 1500 spindles, and manufactures 7000 yards No. 20 cotton cloth weekly.

One of brick, 5 stories, 45 by 156 feet, containing nearly 6000 spindles, and will manufacture from 16,000 to 18,000 yards No. 40 cloth per week.

One of Brick, 6 stories, 49 by 220 feet, exclusively for broadcloths.

One recently erected, of brick, 6 stories high, 49 by 390 feet, for cotton and woolen manufacture. This is the most extensive building devoted to the manufacturing purposes in New Hampshire, if not in N. England.

There is also a building of brick, 4 stories high, 32 by 134 feet, occupied as a dyehouse for the manufacture of carpets, &c., another house of brick, 3 stories, 28 by 100 feet, for drying. A building of brick, 35 by 65, for trip hammers and machine shops. There is also an extensive range of work shops; 40 dwelling houses of wood, 2 stories high, 24 by 40 feet; 5 extensive boarding houses: 5 brick blocks, of 30 by 80 feet each, 3 stories; and a great number of buildings occupied by mechanics. A spacious and elegant brick hotel, 3 stories high, has also been erected, where the traveller meets with good accommodations.

The village contains about 1500 inhabitants—about 1000 of whom are enrolled in the factory books. This establishment is situated on Salmon Falls river, about three miles from tide waters.—The resources of the river are abundant, having extensive ponds for reservoirs. The fall at the control of the Great Falls Company is 120 feet, and only about one-sixth of the power will be used for the factories now built.

Essays on Bleaching. *By* JAMES RENNIE, A. M. *Lecturer on Philosophy, &c. &c. London.*

No. I.—HISTORY OF THE ART.

Section II.—THE art of bleaching was known to our ancestors in Britain as early, at least, as the first century, as we are informed by Pliny, (Hist. Nat. lib. XXX. *c.* 50.) who tells us, "that the flax, after being spun into yarn, was pounded several times in a stone mortar

with water; and when it was woven into cloth, it was beaten again upon a smooth stone, with broad headed cudgels; and the more frequently this process was repeated, the whiter and softer the cloth became." A more accurate description could not be given, of a process which every Scotsman, who has lived in the country, must have seen employed by the peasants of the present day. This simple process, however, is aided by boiling with soap or kelp, and by crofting; but even in Pliny's time, they had recourse to vegetable alkalies, as he tells us, in the following book, that the process was much facilitated by macerating in the water the roots of a kind of wild poppy, which was much sought after for this purpose, and made the linen look "wonderfully pure and white." Might not this wild poppy be the cuckoo pint, (*Arum maculatum*, Lin.) which even in modern times has been used in bleaching in France and other parts of Europe? (Parkes' Chem. Ess. IV.) We are told by Lewis, (Newman's Works, II. p. 226.) that the juices of this plant have the property of destroying the resinous colouring matter of vegetables; but I think the effect might be better accounted for by a peculiarity in this plant, first observed by Lamarck and Sennebier, namely, that it contains a greater quantity of sensible heat than any other plant whose temperature has been examined. (Smith's Intr. to Bot.) The use of plants in bleaching is not peculiar to Europe. The Indians in North America, as M. De Lery tells us, make a detergent water from certain fruits, with which they wash and bleach their cotton beds and garments. (Voyage de J. De Lery, p. 276.) It is likely that he here alludes to the fruit of the Myrica Cerifera, of the mode of making soap from which, M. Cadet gives an excellent account in the Annales de Chimie. Dec. 131.

We need not wonder that attention would be paid to this art among the Greeks and Romans, when we are aware of the delicate fineness to which they brought their linen cloth, and the value at which certain sorts were estimated. We are informed by Pliny, that a kind of lawn, made from the flax denominated Byssus, which grew in Achaia, was so much esteemed in the first century as an ornamental dress, that it was sold for its weight in gold. We are at no loss from this to see, why its use was considered, by some austere Romans, as a mark of unpardonable luxury and effeminacy, (Hist. Nat. lib. II. *c.* 1.;) and the same author tells us, that the threads of the Retovine linen are evener, if evener may be, than that of a spider: he himself had seen so fine and small a thread of Cumes flax, that a whole net knit of it would pass through the ring of a man's finger; and he had seen also some so fine, that one man could easily carry as much yarn as would go round and compass a whole forest. But the *finest cloth*, he says, (lib. XII. *c.* 10.,) which was made in his time, was manufactured from the cotton which grew in India and Persia. There was a great difference, however, in the whiteness of the several sorts of linen, either from the mode of bleaching, or from the nature of the materials. The Faventine, for example, was always whiter than the Allian, which was commonly brown before it was bleached. Pliny likewise gives an account of

the earths and plants employed by the Romans in bleaching and washing; but it is likely that these methods were soon improved after his time, as we know that the manufactory of soap contrary to the assertion of Beckman, was carried on to some extent in Italy; and it is not long since a complete manufactory for boiling soap was discovered in the subterranean Ruins of Pompeii. This soap had been made by combining alkalis with an oil. (See Starke's Letters from Italy.) Immediately subsequent to the time of Pliny, the Romans indulged in what their fathers had considered to be effeminate; and white cloaks of linen were almost universally worn. (Beckman's History of Inventions, III. p. 270.) May we not then consider it rather as a poetical flourish than a correct description, which we find in Valerius Flaccus, of the dress of a warrior who was slain at Colchis during the Argonautic expedition; especially when we consider, that this author lived near the time of Pliny, when linen was still of inestimable value? The passage runs thus:

Cadit——Taulantis alumuus——
Tenina non illum *candentis carbasa lini*,
Non auro depicta chlamys, non flava galeri
Cæsaris, pictoque juvant subtemine bracal.
Val. Flaccus, VI. 221.

We cannot however distrust an eye witness:

Ἐστρωθησαν δια Χαλυβων——ωλον δι θωρακας λινους μιχρι του ιτρυ.
Xenoph. Anab. IV.

The preceding notices, it must be confessed, are scanty and imperfect; but they are all which I have been able to collect from my limited acquaintance with antiquities. In the ages which succeeded those of which we have now been speaking, our information upon this, as upon almost every other topic, is altogether imperfect. It is probable that the art in question, remained nearly as it had been transmitted to the people of the middle ages from the ancients. This amounts nearly to a certainty, when the earliest of our modern processes are compared with what we know of antiquity. In Iceland, which, from its remoteness, we may suppose comes but accidentally acquainted with the improvements made in the other parts of Europe, they bleach with a ley made of ashes and urine. (Hist. de l'Islande, I. 266.)

The earliest account which has come to my knowledge of the mode of bleaching in modern times, is given in a book now become scarce, but a copy of which I was so fortunate as to procure from Stirling's Public Library; it is entitled, "Select Essays on Commerce," &c. (8vo. Lond. 1754.) The mode of bleaching there described, was practised in Holland and Flanders, and consisted in souring with milk or bran, in boiling with alkaline leys, and in exposing the goods for a whole summer to the sun and air. This book, however, must be comparatively modern with the processes it describes; for long before this we find "*Holland* white as snow" mentioned in our old ballad poetry. There are indeed few of our oldest ballads and traditionary legends which do not mention shirts

and other garments made of "Holland fine." The Dutch and Flemish process being unknown in the other parts of Europe, it began to be supposed that there was something in the air or the water of Holland which produced linen of so clear a white; and the adjacency of the sea was mentioned as one of the causes of this. All the bleaching grounds in Holland, indeed, were situated near the sea, as it had been found by experience that the sea air seemed to produce a fairer white, than that farther inland. If the cause of this had been inquired into with any degree of philosophical acuteness, it might have led rapidly to the unexampled chemical improvements which have been lately made in the art of bleaching. But the period of which we speak, was only the dawn of the philosophical arts. Every process was conducted by blind precedent, without the slightest hint ever intruding itself *why* such things were done. But this dawn, faint as it was, soon brightened into all the splendours of noon-day; and if I am not misinformed, the world is indebted to Scotland for the first application of chemistry to the art of bleaching.

Two years after the publication of the Select Essays, Dr. Home, the Professor of Chemistry in the University of Edinburgh, published his inestimable Experiments on Bleaching, in which he proved that employing oil of vitriol (sulphuric acid) for souring linen goods was both more economical, more efficacious, and less liable to uncertainty than the Dutch mode of souring with milk or bran. Previous to Dr. Home's experiments, the art of bleaching was quite in its infancy in Britain. Even so late as 1752, British linens were sent to Haarlem to be bleached at a considerable expense and much loss of time. The Dutch process is commonly supposed to have first been practised by the Scotch; but it was certainly first known to the Irish. The Scotch linens were usually sent over to Holland in March, and were not returned in a finished state till October following, when they were sent to the London market under the name of Scotch Hollands. On the authority of Patrick Milne, Esq. M. P., Mr. Parkes states, (Chem. Es. IV. p. 18,) that an Irishman who had learned something of bleaching, settled, in 1749, in the North of Scotland, and was entrusted with the linens to bleach which had formerly been sent to Holland. His first attempts, however, were unsuccessful, and after he had done his utmost, the Goods had to be sent to Holland to be finished. But several years' inquiry and experience made him an excellent bleacher, and by assiduously practising the art, he soon realized an opulent fortune. At the same time the Scotch manufacturers were greatly benefited by having their goods sooner ready for the market, and their capital more quickly circulated. Dr. Home's improvements, which immediately followed this, gave our countrymen a decided superiority in this art, and the North of Scotland soon stood as high as Holland and Flanders had previously done.

In order to show the advantages of Dr. Home's improvements, it may not be out of place to give an account of the mode which was previously followed, a little more in detail. For this purpose, I shall select the process for bleaching linen yarn, which was very operose, and required four times the expense of cotton yarn; inasmuch as the

colouring and resinous matter is in much greater quantity in the former. Most sorts of linen yarn, for example, will lose 27 per cent. of their original weight before they are thoroughly bleached, while cotton yarn will lose only 4½ or 5 per cent. by the same process. The following account is given by Parkes, of the mode of bleaching linen yarn about half a century ago. The brown yarn was first immersed in hot water for three or four days, or macerated in cold waste alkaline leys for about forty-eight hours, which by producing a fermentation in the vegetable substance, or otherwise acting chemically upon the fibres, loosened the saliva of the spinner, or such foreign and heterogeneous matters, and rendered them easy to be removed by simple washing. The yarn was next boiled and steeped in alkaline ley, the apparatus being so contrived that the ley was poured over the goods, through which it percolated till it reached the bottom of the vessel, whence it was drawn off into a heated copper; and from this again it was pumped back over the goods, and so on alternately and uninterruptedly for many hours. The yarn was then well washed and exposed on the grass for two or three weeks. It was now bucked again, washed, and crofted as before; and these processes were alternately continued four or five times, the strength of the ley being gradually reduced in each successive bucking. After the yarn had been bucked four or five times, it was immersed in soured milk, in which it lay two or three weeks, till the scum, formed by the matters disengaged by fermentation, began to crack and subside. The yarn was then taken out of this *first sour*, and well washed; and the processes of bucking, washing, crofting and souring, were alternately repeated till it was thought to be clean and of a good colour. For cleansing and finishing they employed soap, which renders the goods soft and delicate, and makes them handle better than when they are simply washed in pure water. Now, from this account it is evident, that the old mode of bleaching was extremely tedious, troublesome, and liable to great uncertainty of result. If goods were sent to the field in March, they were not ready for the market before September; and if at midsummer, they could only be half-bleached that year; because it was found, that crofting succeeded best in the spring, and when any were unfinished in autumn, they were laid aside till March following.

The improvements of Dr. Home, then, were of great importance in saving time; for, by making the sours of sulphuric acid, instead of milk, the process of souring, which formerly took two or three weeks at each repetition, could be finished in as many hours. A great deal of trouble was also saved; for great quantities of milk being requisite, it could not easily be collected, and carried from great distances to the manufactory, as would frequently be necessary. The expense, likewise, of sulphuric acid, was considerably less than that of milk, owing to the improved process which was about this period invented by the ingenious Dr. Roebuck, for the extensive manufacture of this acid.* They

* The first large leaden chamber for this purpose, was erected by him at Birmingham, in 1746; and, in three years afterwards, he established extensive

found that sours composed of it, acted with more certainty and effect; while they did not, in the least, injure the fabric of the cloth. A prejudice long subsisted, indeed, which is not even yet wholly removed, that the fabric is weakened by vitriol sours; but Dr. Home proved, in the most satisfactory manner, by repeated experiments, that it is altogether unfounded. He kept, for example, a piece of linen in a strong sour of vitriol during several months, and the fabric of the cloth remained as firm and strong as before it was immersed. Even in the present improved state of chemical bleaching, this improvement of Dr. Home's is of importance, and is still used in conjunction with those which are much more powerful.

(TO BE CONTINUED.)

On the Nature and Properties of Timber, extracted from "The Elementary principles of Carpentry, by THOMAS TREDGOLD."

(Continued from page 178.)

Effect of continued Moisture with Heat.

Wood, in common with other vegetable products, when exposed to a certain degree of moisture, and at a temperature not much under 45 degrees, nor too high to evaporate suddenly all the moisture, gradually decomposes. This decomposition is called putrefaction by chemical writers, but is called the *rot* in common language. It proceeds with most rapidity in the open air, but the contact of air is not absolutely necessary. Water is, in all cases, essential to the process; indeed, it is a principal agent in all processes of decomposition.

As the rot goes on, certain gaseous matters are given out; chiefly carbonic acid gas and hydrogen gas.

Pure woody fibre, alone, undergoes this change slowly; but its texture is soon broken down, and it is easily resolved into new elements, when mixed with substances more liable to change. "Any process," observes Sir H. Davy, "that tends to abstract carbonaceous matter from it, must bring it nearer in composition to the soluble principles," and this is done by fermentation. Hence it is, that the sap-wood is of a more perishable nature than the heart-wood; for the sap-wood abounds more in saccharine and fermentable principles, and, consequently, sooner ferments. Dr. Darwin took part of the branch of an oak tree, cut in January, and divided it carefully into three parts, the bark, the alburnum, or sap-wood, and the heart-wood. These were each shaved, or rasped, and separately boiled in water, and then set in a warm room to ferment. The decoction of the sap-wood passed into rapid fermentation, and became acid; but not either of the others.

Duhamel tried some experiments to ascertain the effect of confining the sap in green timber; and found, that the pieces thus confined soon exhibited signs of rapid decay; and, therefore, he strongly recom-

works on the same plan at Prestonpans, whence he supplied not only bleachers and other manufacturers of Scotland and Ireland, but also those on the continent, who soon learned to prefer it to milk sours.—*Parkes.*

mends a free space for the circulation of air round the ends of joists and beams, instead of building them in the wall. Duhamel also tried the effect of covering the external surface of timber with paint, tar, and pitch; and found that it contributed much to the durability of dry or well-seasoned timber, but hastened the decay of green and unseasoned timber.

Quicklime, when assisted by moisture, has a powerful effect in hastening the decomposition of wood, in consequence of its abstracting carbon. Mild lime (carbonate of lime) has not this effect. But mortar requires a considerable time to bring it to the state of mild lime; therefore, bedding timber in mortar, or building it in walls, where it will long remain in a damp state in contact with mortar, is very injurious, and often the cause of rapid decay. Wood in a perfectly dry state, does not appear to be injured by dry lime; of this we have examples in plastering laths, which are generally found sound and good in places where they have been dry. Lime also protects wood from worms.

Volatile and fixed oils, resins, and wax, are equally as susceptible of decay as woody fibre under the same circumstances; hence we see the impropriety of attempting to protect wood in any situation where the coat of paint, &c. cannot be renewed from time to time; and also, that woods abounding in resinous matter, cannot be more durable than others.

Decay sometimes commences in the growing tree; for when it has stood beyond a certain age, decay at the heart has generally made some progress. I have often observed this in large girders of yellow fir, which have appeared sound on the outside, but, by removing some of the binding joists, have been found completely rotten at the heart. It is on this account, that the practice of sawing and bolting girders is recommended.

It is usual to divide the rot into two kinds, the *wet rot*, and the *dry rot;* but I have not been able to discern any real distinction between them, except that in the one, the gaseous products are evaporated, and in the other, the greater part of them run into a new combination, which is a species of fungus. Both, in a chemical sense, are produced by precisely the same causes, with this exception, that a free evaporation determines it to be the wet rot; a confined place, or imperfect evaporation, renders it the dry rot, as timber must be decomposed before it can become the food of a plant: they are evidently the same with the putrefaction of chemists. It is said, that the decay of a post, placed in the ground, or in water, is an example of the wet rot; and it is assumed, that the parts undergoing the process of decay, are alternately wet and dry; but the fact is, they are constantly supplied with that degree of dampness which is essential to putrefaction. For "timber being composed longitudinally of an assemblage of pipes or tubes, it is only necessary that one end of a log of wood should be placed in a damp or wet situation to occasion the moisture to be conveyed to the opposite end by capillary attraction." Prevent a free change of atmospheric air, and a post so circumstanced, it is well known, would be affected with the dry rot. Hence it appears to me,

that some writers are mistaken in asserting, that they are "essentially different, both in the symptoms, the progress, and the causes."

When only the external part of a beam has been seasoned, and the sap has never been evaporated from the internal part, the rot will be an internal disease; and where an internal decay of this kind is found, it proves that the timber has never been properly seasoned. Mr. Bowden, in the plate to his Treatise on the Dry Rot, gives figures of such a piece; it appears to be of common occurrence; and it is evident from such examples of decay, that the want of due time and attention in seasoning, is one of the chief causes of the rapid decay of ships. In Mr. Bowden's specimen, the exterior part, to the depth of two inches from the outside, was as sound as any wood could possibly be; but the central part was filled with a fine, white, thread-like vegetation, extending within the above-mentioned two inches of the exterior surface, and uniting in a thick, fungous coat, at the end of the piece; thus showing the depth to which the seasoning had been effected.

In the first stages of rottenness, the timber swells, and changes colour, is often covered with mucor, or mouldiness, and emits a musty smell. Where the rottenness is internal, or the timber is in a confined place, a new substance is formed between the fibres, of a spongy consistency, resembling the external coat of a mushroom; and the substance itself has been ascertained to belong to the order fungi, of the cryptogamia class of plants.

When the fungus first appears on the sides and ends of timbers, it covers the surface with a fine, delicate vegetation, that has been called by shipwrights, a mildew. These fine shoots afterwards collect together, and the appearance then may be compared to hoar-frost, and increases rapidly, assuming gradually a more compact form, like the external coat of a mushroom, but spreads in the form of leaves, being larger or smaller, most probably, in proportion to the nutriment the wood affords. The colours of the fungus are various; sometimes white, grayish white, with violet; often yellowish brown, or a deep shade of fine rich brown.

It has been considered a question of some importance, to determine how fungi are propagated, or from what they originate; but as such an inquiry can be attended with little, if any, advantage, in preventing the rot, it appears to be better to consider it only so far as it is a chemical change, leaving the question of their origin to the curious, as well as the distinction of the species of fungi.

In the more advanced stages, the woody fibres contract lengthwise, and show many deep fissures across the fibres, similar to a piece of wood scorched by the fire. The woody fibres appear to retain their natural form, but easily crumble into a fine powder. In oak, this powder is of a fine, snuff-brown colour.

The fungus, when it spreads upon the surface of the wood, often becomes of a considerable size, sometimes spreading over the adjoining walls, and ascending to a considerable height.

The decayed state of a barn floor is thus described by Mr. B. Johnson: "An oak barn floor, which had been laid twelve years, began to shake upon the joists, and on examination, was found to be quite rotten

in various parts. The planks, 2½ inches in thickness, were nearly eaten through, except the outside, which was glossy, and apparently without blemish. The rotten wood was partly in the state of an impalpable powder, of a snuff colour; other parts were black, and the rest clearly fungus. No earth was near the wood.

In timber of the same kind, that of the most sappy and rapidly grown trees is the most subject to decay. The wood of trees from the close forests of Germany, or America, is more subject to it than that of trees grown in more open situations; and it is remarked by Mr. Barrow, that "the timber brought from America in the heated hold of a ship, is invariably covered over, on being landed, with a complete coating of fungus." Consequently, the timber must be infected with the seeds of decay before it is brought into use. Also, the custom of floating timber in docks and rivers injures it very much; it would be better to sink it completely under water, as to half immerse it in water is the worst situation it can be placed in.

Though moisture be essential to the progress of decay, absolute wetness will prevent it, especially at a low temperature. In ships, this has been particularly remarked, for that part of the hold of a ship which is constantly washed by the bilge-water, is never affected by dry rot. Neither is that side of the planking of a ship's bottom which is next the water, found in a state of decay, even when the inside is quite rotten, unless the rot has penetrated quite through from the inside.

Warmth and moisture are the most active causes of decay, and, provided the necessary degree of moisture be present, the higher the heat, the more rapid is its progress. In warm cellars, or in any close confined situations, where the air is filled with vapour, without a current to change it, the rot proceeds with astonishing rapidity, and the timber-work is destroyed in a very short time. The bread-rooms of ships, behind the skirtings, and under the wooden floors of the basement stories of houses, particularly in kitchens, or other rooms where there are constant fires, and, in general, in every place where wood is exposed to warmth and damp air, the dry rot will soon make its appearance.

All kinds of stoves are sure to increase the disease, if moisture be present. The effect of heat is also evident from the rapid decay of ships in hot climates. And the warm moisture given out by particular cargoes, is also very destructive; such as cargoes of hemp, pepper, and cotton.

Building timber into new walls, is often a cause of decay, as the lime and damp brick-work are active agents in producing putrefaction, particularly where the scrapings of roads are used instead of sand for mortar. Hence it is, that bond-timbers, wall-plates, and the ends of girders, joists, and lintels, are so frequently found in a state of decay. The old builders used to bed the ends of girders and joists in loam, instead of mortar, as is directed in the act of parliament for rebuilding the city of London. In this place it may not be amiss to point out the dangerous consequences of building walls, so that their principal support depends on timber. The usual method of putting bond-timber in walls, is to lay it next the inside; this bond often decays, and of

course leaves the wall resting only upon the external course or courses of bricks; and fractures, bulges, or absolute failures, are the natural consequences. This evil is in some degree avoided, by placing the bond in the middle of the wall, so that there is brick-work on each side, and by not putting continued bond, for nailing the battens to.

But if the powerful lateral pressure of flat arches were avoided, so many ties, or bond-timbers, would not be necessary. The improper use of arches produces more fractures in buildings than any other cause. Nothing can be more absurd than the construction of the fronts of London houses; they exhibit a continued series of stretchers and ties. Each range of arches is a line of stretchers, and the bond and wall-plates are the ties; and as the arches are close-jointed and well fitted on the outside, but open jointed and indifferently built in the inside, when the building settles, it has a strong tendency to bulge outwards. Thus timber ties are necessary to secure an ill-constructed wall, which consequently cannot be more durable than the timber.

As an example of the danger of trusting to timber in supporting heavy stone or brick-work, the failure of the curb of the brick dome of the church of St. Mark, at Venice, may be cited. This dome was built upon a curb of larch timber, put together in thicknesses, with the joints crossed, and was intended to resist the tendency which a dome has to spread outwards at the base. In 1729, a large crack and several smaller ones were observed in the dome. On examination, the wooden curb was found to be in a completely rotten state, and it was necessary to raise a scaffold from the bottom, to secure the dome from ruin. After it was secured from falling, the wooden curb was removed, and a course of stone, with a strong bond of iron, was put in its place.

The bad effects resulting from damp walls, is still farther increased by hasty finishing. To inclose with plastering and joiners' work the walls and timbers, while they are in a damp state, is the most certain means of causing the building to fall into a premature state of decay.

There is another cause that affects all wood most materially, which is the application of paint, tar, or pitch, before the wood has been thoroughly dried. The nature of these bodies prevents all evaporation, and confines the internal moisture, which is the cause of sudden decay. Mr. Bramley remarks, that both oak and fir posts were brought into a premature state of decay, by their having been painted prior to a due evaporation of their moisture.

On the other hand, the doors, pews, and carved work, of many old churches, have never been painted, and yet they are often found to be perfectly sound, after having existed above a century. In Chester, Exeter, and other old cities, where much timber was formerly used, even for the external parts of buildings, it appears to be sound and perfect, though black with age, and has never been painted.

Mr. Semple mentions an instance of some field-gates, made of home fir, part of which, being near the mansion, were painted, while the rest, being in distant parts of the grounds, were not painted. Those which were painted soon became quite rotten, but the others that were not painted continued firm.

Painted floor-cloths are very injurious to wooden floors, and soon produce rottenness in the floors that are covered with them; as the painted cloth prevents the access of atmospheric air, and retains whatever dampness the boards may absorb, and therefore soon causes decay. Carpets are not so injurious, but still assist in retarding free evaporation.

(TO BE CONTINUED.)

ENGLISH PATENTS.

To SAMUEL PARKER, *of Argyle Street, St. James's, in the County of Middlesex, Bronze and Iron founder, and* WILLIAM FRANCIS HAMILTON, *of Nelson Street, Long Lane, in the County of Surrey, Engineer, for their invention of a certain Alloy or Alloys of Metal.* Sealed 12th November, 1825.

In our present vol. page 32, we noticed the invention or discovery of a new alloy of Metal, which exactly resembles fine gold, and is denominated Or-molu, or Mosaic gold, for which the inventor obtained a patent as above. We had considered this metal to be only a superior quality of brass, presenting a fine gold colour, and it now turns out that our notions were right.

The patentees state in their specification that great care and experience are necessary to the perfecting of this alloy, as the same materials will not, under different circumstances, produce similar results. They make use of equal quantities of copper and zinc, melted at the lowest temperature that copper will fuse, and having stirred them together, so as to produce a perfect admixture of the metals, they then add a further quantity of zinc in small portions, until the alloy in the melting pot becomes of the colour required.

If the temperature of the copper is too great, a portion of the zinc will fly off in vapour, and the result will be, that alloy commonly called spelter, or hard solder; but if the operation is carried on at as low a temperature as possible, the alloy will first assume a yellow colour, as brass, and then by the addition of small portions of the zinc, the colour will change to a purple or violet hue, and ultimately become perfectly white, which is the appearance that the proper alloy should assume when in a fused state. This alloy may be cast into ingots, or in any forms required, and when cold will have the appearance of an alloy of fine gold and copper. But it is difficult to preserve its character when re-melted, as the zinc is very apt to waste by flying off in evaporation, by raising the temperature above that point at which copper begins to fuse.

The Patentees are aware that a variety of alloys of copper and zinc have been made, and that they cannot maintain the exclusive right of mixing alloys of those metals abstractedly; but having after great labour and observation discovered the precise proportions of the two metals, and the modes of treatment which will produce an alloy re-

sembling fine gold, they claim the exclusive right of mixing an alloy of copper and zinc, consisting of from fifty-two to fifty-five parts zinc out of a hundred. [*London Journal of Science.*

Remarks by the Editor.

In vol. i, page 139, of this Journal, we published an account of a new alloy, called *Mosaic Gold.* The foregoing specification is the one to which allusion is there made, and we confess that we have felt some disappointment on reading it, as it appears scarcely probable, that a compound of copper and zinc, possessing all the properties there ascribed to Mosaic Gold, should have escaped the notice of founders, and other workmen, who have been in the habit of combining these two metals in every possible proportion, and employing them for a great variety of purposes. We, however, have determined to have the thing fairly tested by an intelligent brass-founder and metal-worker in this city, the result of which we hope to make known in our next number.

To STEPHEN WILSON, *of Streatham, in the County of Surry, Esq. in consequence of communications made to him by a certain Foreigner residing abroad, for a new manufacture of Stuffs, with Transparent and Coloured Figures, which he calls Diaphane Stuffs.* Sealed 25th November, 1824.

This invention is the production of a novel kind of stuff goods, by a peculiar process of manufacture, which is to be denominated *diaphane stuff.* The patentee states, that this new fabric consists of "a firm or band net work, figured on solid or perfect ground, exhibiting coloured patterns thereon." The method of making this particular kind of stuff can only be well understood by a practical weaver of figured goods.

The threads, or yarns, which are intended to constitute the warp or chain of the fabric, are to be wound with great care evenly upon the beam or roller, and when placed in a loom, are to be edged with cords, for the purpose of forming a strong selvage. They are then to be woven by the intervention of shoots of a coarse material, forming by that means an open fabric, merely for the purpose of giving stability to the warp threads, while the patterns or figures are painted or printed upon them; the coarse material thus shotten is intended to be removed, to give place to the weft-thread that shall be afterwards introduced, when the ultimate weaving is performed.

This fabric is now to be printed or painted in the ordinary manner, with such forms, characters, or devices, as are intended to constitute the pattern. It is then to be streamed, and otherwise operated upon, as is usually practised, for the purpose of fixing the colours, and then washed, in order to remove the gummy matters.

When the fabric has been thus treated, it is to be placed in the loom again, and some of the coarse shotten threads being removed at

the commencement of the piece, the warp or chain threads are to be carefully passed through the spaces of the reed, and then secured, taking great care that the pattern, or design painted thereon, be not disturbed or distorted, the remainder of the coarse weft threads being drawn out in succession, as the work approaches them, that is, as the stuff becomes woven.

The process of weaving is now to go on as usual, by raising and depressing portions of the chain, or warp, and passing the weft or shoot through between, which is to be done in a loom furnished with harness; and having the pattern of the diaphanous or transparent parts read in, as in ordinary figure weaving; or, which is much to be preferred, in a loom of the kind called the *Jaquart*, which the present patentee introduced from France, and became proprietor of, in 1820.

To enter further into the detail and minutiæ of the process of weaving this particular kind of fabric, would be uninteresting, and, perhaps, unintelligible to many of our readers; it will, therefore, suffice to say, that by the above mode of proceeding, a fabric is produced, called diaphane stuff, having certain portions left so thin as to be transparent, upon which are painted or printed coloured figures, which as a whole constitutes a kind of fabric new in this country, the exclusive manufacture of which is claimed under this patent.—[*ib.*

To GEORGE WYCHERLEY, *of Whitechurch, in the County of Salop, Saddler, for his new and Improved Method of making and constructing Saddles.* Enrolled June 1825.

The improvements, upon which this patent is founded, are arranged under three heads: the first is the introduction of an additional padding to the fore part of the saddle, for the purpose of fitting the back of the horse more perfectly than ordinary saddles packed in the common way. The object of this is to prevent the saddles from riding on to the neck of the horse, which it is said to effect in a satisfactory manner; as the straps and girth keep it steady, without the necessity of a crupper. The second head of the invention applies to side saddles, and consists in the introduction of a strap connected to the girth, which strap is passed over friction rollers, mounted in the saddle tree, and to the end of the strap the stirrup iron is attached, so that the foot of the rider pressing the stirrup, draws the strap, and with it the girth, and by those means keeps the saddle firm and tight to the back of the horse. The third head of the invention is the adaptation of the packing first described to the side saddle, for the purpose of fitting it more perfectly to the horse's back.

The mode of constructing these improved saddles may be very easily conceived. A padding, made in the usual way, is to be attached by stitching, to that part of the under side of the saddle tree, which is nearest to the shoulders and neck of the horse; it is to be made thick in front, and diminishing as it recedes, so as to fall into

the ordinary figure of the under side, or packing of the saddle towards the back part.

As respects the side saddle, two angular straps are to be affixed to the saddle-tree on the off side, for the purpose of receiving the buckle and strap, to which the girth is attached, and another strap connected to the girth, is to proceed up between the opening of the angular straps, and to pass over one or more rollers placed in the under side of the saddle, and thence proceeding downwards on the near side of the horse, the stirrup iron is to be suspended to it, so that the pressure of the foot of the rider may act in giving additional tension to the girth.

The introduction of the packing before described, to the under part of the side saddle, is to be effected in the way already explained, and being intended for the same purpose, needs no further description. [*ib.*

To DAVID OLIVER RICHARDSON, *Kerseymere and Cloth Printer, and* WILLIAM HIRST, *Manufacturer, both of Leeds, in the County of York, for their Invention of certain Improvements in the Process of Printing or Dying Woolen and other Fabrics.* Enrolled January 1826.

This invention consists in covering parts of the surfaces of woolen fabrics, with a certain composition that will resist the chemical action of the coloured liquor, into which the fabric is to be immersed in the process of dying: in order that, when the cloth so covered is withdrawn from the dying vat, and the composition is removed from its surface, those parts which have been thus guarded, may have retained their original colour, and not have been in any degree affected by the dying liquor.

The composition is to be made by mixing about five stone of wheaten flour, with about four gallons of water; making a smooth paste, about the consistency of treacle. It is not to be boiled, we presume, as the specification is silent upon that subject. After this mixture has stood for three or four days, the yolks and whites of forty raw eggs are to be added, and the whole stirred well together. The composition is then ready for use; and is to be laid upon the fabric by means of a brush, when large portions of the surface are to be protected, or by printing blocks, when small parts of the surface are to be preserved from the ground colour in the form of a pattern. A small quantity of powdered glass, or shells, or fine sand, is then to be sifted over the composition, for the purpose of assisting to set and bind it firmly; this, however, may be dispensed with, if the composition is thick, and can be dried soon. The fabric being thus prepared, is then ready to be immersed in the dying vat, and treated as usual.

When the dying process has been performed, the fabric is to be withdrawn from the vat, and the composition being scraped off, or otherwise removed, presents those parts which were covered, perfectly

free from the colour of which the other portions of the surface of the fabric have been dyed.

For the purpose of further illustration, the patentee describes the process of dying and figuring a lady's shawl in several colours. Suppose one side of the shawl is to be dyed of a plain blue, all over its surface, and the other side is to have a rose coloured ground, with a white border, to be afterwards printed with a chintz, or other pattern. The shawl being stretched upon a square frame, that side which is to be blue, and that part of the other side intended for the border, is to be covered with the composition as a guard, leaving only that part exposed, which is designed to be dyed a rose colour; the frame, with the shawl, is then immersed in the dying vat, and remains there until it has imbibed its tint.

The shawl being now withdrawn from the dye, that side which is intended to be blue, is to be cleared from the composition, and the other side covered completely. It is then immersed in the blue dye, and after that operation has been performed, the whole of the composition is to be removed, and the shawl will appear blue entirely on one side, and rose coloured, with a white border, on the other; which, being afterwards printed in the ordinary way, with a chintz or other suitable pattern, finishes the colouring of the shawl.

The patentees state, that their claim of invention, is the "covering of parts of woolen, or worsted fabrics, which are to be dyed, or dyed and printed, with a composition which resists the action of the dye, when the fabric is in the dye kettle." How this can be exclusively maintained, we do not see, as table covers, and a variety of other articles, which have been coated and dyed in this manner, for a considerable length of time, having purple or green grounds, with yellow or white borders and corners. The patentees also claim the application of "the particular composition herein before described, to that particular purpose." This particular composition, if it has not been so used before, they have a right to, but certainly not to claim the whole, in the broad way in which they have stated it. [*ib.*

To John Phillips Beavan, *of Clifford Street, in the County of Middlesex, Gentleman, in consequence of Communications made to him by a certain Foreigner residing abroad, for an Invention of a Cement for Building, and other purposes.* Enrolled April 1826.

This invention is called Vitruvian cement, and consists of a composition of marble, flint, chalk, lime, and water, which, when dry, is capable of being brought to a high state of polish.

The proportions are, one part of pulverized marble, one part of pulverized flint, and one part of chalk, mixed together, and sifted through a very fine sieve; to this is to be added one other part of lime, which has been slacked at least three months. To this is to be added a sufficient quantity of water, to make the whole into a thin

paste, and in that state it is to be spread as thinly as possible over a coarse ground, and brought to a smooth surface by the trowel. This cement, when dry, may be polished with pulverized Venetian talc, until the surface has become perfectly smooth and shining.

In order to apply this Vitruvian cement to buildings, it is necessary that the parts to be covered should be first prepared with a rough ground, or under coat, which may be done with the following materials. Take equal parts of the coarsest river sand, and the sand which is pulverized from mill-stones; mix them together, and add a third part of lime, which has been slacked for about three months; to these put as much water as will bring the composition into a paste; and when it is about to be used, add a fifth of very fine sifted lime, and apply it as common plaster.

If the above Vitruvian cement is required to imitate the appearance of marble, that may be done by painting the veins like marble upon its surface, after the cement has been brought to a smooth surface by the trowel; and as soon as the paint has become dry, the polishing process may be performed with the pulverized talc, as above described, when the work may be considered to be finished.

In order to increase the lustre of the polish, the patentee proposes to employ a sort of varnish, to be made by mixing two pints of water with four ounces of white soap, eight ounces of virgin wax, and eight ounces of nitre, which are to be boiled together, till the substances are quite dissolved. When the cement is perfectly dry, this varnish is to be sprinkled over the surface, and when uniformly spread, is to be rubbed well with a linen cloth, until the lustre is sufficiently brought up. It is, however, to be observed, that this varnish is not claimed by the patentee; but is merely mentioned as a useful addition to improve the lustre and appearance of the cement, when a high polish is required, as in imitating marbles. [*ib.*

ANCIENT VASES.

(Continued from page 114.)

We shall place in the first class those vases in which the colour of the clay is natural, without glaze or other coating, or painting. Of this kind are some vases which were dug up at Cumæ, as well as near S. Agatha Sothorum, along with others of a black colour.

In the second class, we shall place those in which the natural colour of the clay is somewhat heightened by their having a very thin glaze or coating.

To the third class, belong those vases which have been manufactured of clay intermixed with black matter. These vases are found, either simple, that is, without ornaments and paintings; or decorated with ornaments, either impressed or in relief; or they are painted with a white or yellowish colour. Of this description are many of the vases dug up, not only in Lower Italy, but also in the districts of ancient Etruria.

To the fourth class belong those vases whose clay is evidently

covered over with a black glaze or coating. Like those of the third class, they are either simple, or with ornaments, either impressed, or painted with a white, yellowish, or red covering.

The fifth class may contain those vases, in which, upon a basis of clay, either of the natural colour, or with a somewhat brighter glaze, there are ornaments or painted figures of a black colour, sometimes with impressed lines. These vases, which have been dug up in various places, although they commonly go by the name of Sicilian, are either simply painted with black, or ornamented with figures, in which the red and white colours are covered over with black: of which kind some exquisite vases have been found, as for example, in the vicinity of Pæstum.

To the sixth class we shall refer those painted vases, the most common of all, which have figures and ornaments either of the natural colour of clay or somewhat heightened, the general ground, however, and some lines, being black; some of them are of more simple construction, others are ornamented with white, red, yellowish, or dusky colours.

The seventh class includes those vases of rarer occurrence, in which the ground is black, and the figures, which are red, are laid upon a white colour covering the black, the lines being impressed so as to penetrate to the black ground.

The eighth class we shall appropriate to those very rare vases, commonly, but falsely, called Egyptian, in which the ground is yellowish, and the paintings of a coffee-colour, which, however, do not cover the ground perfectly, there being sometimes a covering of white and red colours. These vases, found in Lower Italy, correspond, in so far as regards the colour of the clay and paintings, with others discovered in Greece, one of which, that had been dug up at Athens, is preserved in the Museum of our University, having been presented to it by the celebrated English traveller Hawkins.

SECT. II.—*Of the Composition of Vases, commonly called Etruscan, in detail.*

1. *Qualities of the Materials.*—The vases described in the preceding section are formed of a fine clay, which is impregnated with iron, and consequently reddens more or less by the action of fire, but whose qualities differ in the different varieties of those vases.

The finer substance of the better sort of painted vases, is that of which the vases with a simple black coating, or those entirely black, are composed, the specific gravity being in proportion to the degree of fineness. The whole of these vases are indeed very light, but more especially the finest kinds; and in them also there is considerable difference with regard to this quality. The vases of Nola seem to exceed the rest in lightness; and by this general quality, in fact, the truly antique vases may readily be distinguished from all imitations of them.

Certain differences are also to be observed in the colour of the materials. In the more valuable kinds, it sometimes approaches to brick-

red, but its most common tint is yellowish-red. In the coarser kinds, the colour of the clay is usually paler than in those of finer texture.

I cannot, however, agree with those who are of opinion that a red pigment has been added, in order to increase the intensity of the colour; for this reason, that the internal colour of the mass agrees perfectly with that usually observed in ferruginous clay that has undergone the process of roasting, and the fractured surface exhibits no inequalities in regard to colour.

In the finer vases there are no heterogeneous parts, nor is any admixture, as of sand, for example, observable. They have been manufactured either of clay in the natural state, if it had been pure, or carefully prepared by washing.

The colour of those vases which are decidedly black, has, without doubt, been produced by the admixture of some black substance, and not by the natural colour of the clay, or by the action of vapours. Upon accurate examination, yellowish particles, together with small black shining grains, are observed in the black mass; from which it may be supposed that the mixture has not always been perfectly equal. The celebrated Brochi detected minute scales of mica in the substance of the black vases found in the ancient sepulchres of Etruria.

According to the chemical analysis of Vauquelin, a hundred parts of the mass of those vases usually called Etruscan, contain—Silica, 53; Alumina, 15; Lime, 8; Oxide of Iron, 24. This quantity of iron, it may be remarked, is singular, and is probably not so great in the whole of these vases.

2. *Conformation of the Vases.*—The vases commonly called Etruscan, seem, without exception, to have been moulded on the wheel; the invention of which is, without doubt, of the greatest antiquity, as has lately been ingeniously demonstrated by the investigations of my friend Ritter. That the whole of these vases were, in reality, formed by the wheel, appears to be proved by the following considerations:—1. Because no other forms are seen in them, but such as can be produced by the wheel; no vases of such a form as to present an oval in their transverse section, or exhibiting other curves deviating from the circle, which could only be produced by the aid of moulds or other means. 2. Because traces of the wheel often occur, especially on the inner surface of the vases, as well as beneath, on the base, and in other parts not so carefully smoothed as the rest. 3. Because, on the other hand, no marks are ever observed, from which it might be inferred, that these vases have been fabricated by a more complex and artificial method; for example, no seams, which it is difficult to avoid when moulds are used.

Vases are more or less accurately shaped. The finest kinds, turned with the greatest care, and ornamented with paintings, are exact in their dimensions, with thin walls, and a smooth surface, having no marks of the wheel; from which it may be conjectured, that, after the vases had been formed in the wheel, some processes had been adopted for smoothing the surface, perhaps not unlike those which are applied by our own potters to the same purpose.

It is unnecessary for us to enter in this place upon a full account

of the particular forms given to these vases, as they have been described and delineated with sufficient accuracy, in many works on the subject. The variety is not less to be admired than the elegance of the forms, although in this respect also some differences are observed between the more exquisite vases and those of inferior quality, between the Grecian vases and those of Etruscan origin.

According to their forms, four principal classes of vases may be distinguished. 1. *Vases properly so called.* They differ greatly in size and proportion of parts. The mouth is either much greater than the diameter of the body, or is of the same size, or smaller. In this manner, it is often furnished either with a lid, or with a cup or funnel-shaped process. The body is usually ovate, or approaching to this form, or bell-shaped, or calyciform: of these principal forms there are, however, innumerable varieties. Vases occur either simple, or furnished with handles, of which there are two, or three, or sometimes four, and these are affixed to the lip, or body, or lower part of the vase.—2. Vases, commonly called *Præfericula* by the ancients, which are usually furnished with a single handle.—3. *Vasa unguentaria*, with a long narrow neck.—4. *Patæra* or *Goblets*, which have commonly two handles.

There are certain parts in vases which have not been formed along with the body upon the wheel, but have been made separately, and afterwards joined to the body. Of this kind are, 1. The handles, with which vases and goblets are frequently furnished; 2. A prismatic base, instead of the common round one. This, however, is of a very rare occurrence in vases: I have seen an instance of it in a vase of Grecian origin, in the Royal Collection at Naples. In these parts I have found no indication of their having been formed in moulds: they seem, without exception, to have been made by the hand and instruments.

3. *Composition of the Plastic Ornaments of Vases.*—The plastic ornaments which we find upon vases, have been made by the wheel, or in some other way. Of the former kind, are all those simple ornaments, whether raised or impressed, with circular outlines, which surround certain parts of vases, as, for example, the upper margin, or ball of the lid, which have, without doubt, been formed in a way similar to that employed by our potters, by means of certain instruments.

To the plastic ornaments not prepared upon the wheel, belongs the raised work, which is sometimes, though rarely, seen in the principal part of vases, and more commonly on the handles. Some black Etruscan vases, preserved in the public collection at Florence, are furnished with raised ornaments on the principal part, or body. Two large vases, of elegant form, are encircled by vine tendrils. Others of them have raised figures of animals. Some, again, with a narrow neck, are terminated by vine-leaves. In others, there are rounded raised lines, which rise from the bottom to the bulging part of the body, or descend to it from the neck. The handles are ornamented in this way, not only in the black Etruscan vases, but also in the painted ones of Grecian origin. They are often terminated by heads, or entire figures,

beautifully imitated, or are made to assume the form of twisted serpents, or are marked with depressed, or raised, lines.

It is a question, whether these ornaments have been made by means of moulds, or simply by the hand. From the inquiries which I have made in regard to this matter, I am inclined to think, that all those plastic ornaments have been formed with the hand, by means of simple instruments, and not by moulds, as is now practised. 1. Because no marks of moulds, no seams, for example, are to be observed; 2. Because small differences are commonly found in ornaments of the same kind: the heads or figures of handles, for example, in the same vase, differ a little; the excavated or rounded lines, in the same part, have not always the same dimensions. In the latter pottery-work of Roman origin, on the contrary, the use of moulds may commonly be observed.

Impressed ornaments also sometimes occur, especially in the black Etruscan vases. They consist either of impressed lines or dots. Ornaments of this description, may easily be formed by instruments similar to those which are used in making seals. The differences, however, often conspicuous in those ornaments in the same vase, appear to me to prove, that they have not been made in this way, but by means of a hard stilus. In one part of the ornaments, for example, the number of dots is greater than in another, or the dots in one row are a little nearer than in another. I have remarked the same of the letters which are sometimes seen on Grecian vases. Upon examining them, it clearly appears that they have not been inscribed by instruments similar to those used in cutting our seals, but also by means of the style. Among the Romans, in later times, stamps, or seals, with elevated letters, as on coins, were very frequently impressed upon earthen-ware, such as bricks, vases, and lamps.

4. *Baking of Vases.*—The whole of the vases of which we speak, are baked, but in different degrees, never more, and generally less, than our best pottery-ware. According to the opinion of the celebrated Chaptal, which agrees with the above, the heat applied for baking may be estimated at seven or eight degrees of Wedgwood's pyrometer. We never find the argillaceous mass converted into glass, nor the smallest indication of fusion; there is never, therefore, any resemblance to the stone-ware of the present day.

The finer painted vases are universally more baked than the coarser, and of the latter, those which are entirely black are the least baked; the different degrees of baking being estimated by the difference in hardness, sound, and porosity; the latter of which is known by the different degrees in which the mass absorbs water.

It is the general opinion of all who have written on the composition of antique vases, such as Grivaud, Rossi, Hirt, and Jorio, that the painted vases of antiquity have been manufactured in the same manner as our finer modern pottery-ware; that after being first baked, the paintings have been applied, and the whole submitted again to a greater heat.

From the vases themselves, we cannot now learn whether they have been once or twice baked; but from any investigations, with regard

to the nature and composition of the paintings, it seems to me more probable that the whole have been once strongly baked, by which they have acquired the necessary degree of hardness and fineness, and at the same time preserved their porosity, and that the colours have afterwards been spread over them by a lesser heating.

5. *Composition of the Paintings.*—In a disquisition regarding the mode in which the colours may have been applied, the following subjects demand investigation:—1. The nature of the pigments; 2. The mechanical mode in which they are laid on; 3. The operations used after the pigments have been applied.

None of the vases are overlaid with the vitreous substance which we call *glaze*, either joined with the colours, or separated from them. The vases which are entirely black, have no coating different from the mass, and the lustre of the surface is produced by the substance of the vase itself, as we shall presently show. Other vases are furnished with a simple black coating, which, however, has no resemblance to the glaze of our earthen-ware, but is more like varnish. Painted vases either show in certain parts a surface of baked clay, or there is a very thin, pellucid, varnish-like coating of clay, by which the colour of the clay is heightened a little, so as to have a dusky or dark red appearance.

A black colour, corresponding with the black coating of some kinds, is very common in the paintings of vases. Other colours appear much more rarely, and less extensively applied.

This black colour, therefore, we shall examine first, as being, of all things connected with vases, in so far as regards art, the most worthy of accurate investigation. It is usually of a pitchy tint, sometimes passing into brown, or, when thinly applied, appearing even of a coffee colour. It seldom passes into livid, or green, which I have observed, however, in some vases of the Florentine and Roman collections. The lustre of the colour is of various degrees of brightness, sometimes it is scarcely apparent, and is always more like that of varnish than of glass. In other respects, also, the black coating is always dissimilar to glass: when minutely examined, however, with the microscope, it has the appearance of being fused. It is of different degrees of thickness, seldom so great as to be sensible to the touch. The black coating is firmly adherent to the surface, although it does not penetrate into the clay, nor is conjoined with its particles by fusion. Its adhesion is firmer in the finer vases, than in those of coarser quality. None of those cracks or fissures are seen in it, which frequently occur in the glaze of earthen-ware. It is not dissolved by acids, or any other fluid. I have exposed fragments of painted vases for a long time to the action of nitric and muriatic acids, but never observed any effect produced upon them. It even sustains a considerable heat without injury, and it may be exposed for a long time to the blow-pipe, without undergoing any distinct change. When the condensed flame was directed toward part of the paintings for some time, I have observed that the nearest parts of the clay were covered over with a black exhalation; but I cannot say whether this exhalation be produced by a sublimation of the pigments. The black var-

nish is sometimes covered over by a white exhalation, when burnt; the production of which may perhaps be explained, from the decomposition of its substance. More accurate investigation, however, has shown me, that the white colour arises from the burning of the calcareous particles intimately conjoined with the surface of the vases, and cannot be ascribed to the ashes of the varnish.

(TO BE CONTINUED.)

On the construction of Fire Places. By DR. ARNOTT.

During my attendance lately in some cases of pulmonary disease, while considering how best to attain the important objects of uniformity of temperature, and the prevention of draughts or currents of air in the apartments to which the patients chiefly confined themselves, a simple means occurred to me, which, on trial, perfectly succeeded. It is an addition easily made to any fire-place; and as its uses are important to the health and comfort of all the inhabitants of cold climates, I am happy to suggest it to the public.

It is simply a glazed metal frame-work, or window, placed before the fire, and coming in contact with the chimney-piece and hearth all round, so as perfectly to cut off communication between the room and the fire-place, and the fire is fed with air brought by a tube from without.

Completely to understand the effect of it, it may be remarked, that of the heat produced by the combustion of fuel in a common fire-place, a part radiates into the room as the light does, and the remainder ascends the chimney with the smoke. That which finds its way into the room, contrary to common apprehension, is probably not more than a fourth part of the whole heat produced; but even less than this would be sufficient to preserve in the room the desired temperature, could it be all retained. The great current of air, however, in the chimney, carries this heat again quickly with it, (for it is the warm air of the room passing away,) and a chimney of the ordinary proportion, and with the ordinary velocity of the smoke, will allow the whole air of the apartment to pass out by it in less than half an hour.

The glazed frame, then, described above, will prevent, it is evident, the heat when once received into the room from again escaping from it, as it now does, with the air ascending in the chimney; and although the glass is some obstacle to the radiation of the heat from the fire in the first instance, the disadvantage is much more than compensated by its retaining agency afterwards.

One of our rooms as now constructed and heated, may be compared to a vessel of water of similar shape, with a hole near its bottom, through which the water is constantly running off, while an attempt is making, at the same time, to warm its contents by heat radiating inwards, from the hole and around it. The hottest water would always get out first, being nearest to the opening from whence the heat came; and to keep the vessel full, this would be replaced by fresh cold water entering by one or more openings in the circumference.

It would require a powerful heat indeed, to raise much the temperature of such a vessel; and it is evident, that no degree of heat so admitted could warm the contents uniformly.

It may be supposed that I have underrated the proportion of caloric which radiates from a fire into the room, compared with that which ascends into the chimney, in calling the former only a fourth part of the whole produced; but the following considerations, without new experiment, may probably be accounted decisive of the question. Mr. Leslie, in his experiments on heat, found that a metallic vessel of water, of medium temperature, suspended in the air, lost about half its caloric by radiation, and half by contact with the air. At a higher temperature, however, on account of the increased velocity of the air, caused by its greater expansion, or in an artificial current of air, without higher temperature, it lost much more by contact than by radiation. Now, in a fire are found the two circumstances of extreme heat and great velocity, and to these is added a third, of much greater importance than either, viz: the surface of contact being exceedingly increased by the air passing between the pieces of coal, while the surface of radiation, viz: the external surface, remains the same. It is a thing not sufficiently adverted to in the management of our fires, that the heat given into the room, is proportioned rather to the extent of burning surface presented towards the room, than to the depth of the fire, the intensity of the heat backwards, and the quantity of the fuel consumed. I have been trying experiments, with a view to ascertain the proportions exactly; of which, however, I have not as yet had time to prepare an account for publication; but as the general result, I may state, that a tile or sheet of iron, laid on the back part of the fire, so as to cover it closely, and to prevent combustion except in front, rather increases than diminishes the radiation of heat towards the apartment, and much less fuel is consumed.

In constructing the glass frame proposed, a part must be made to open, to allow the putting on of coal, and stirring of the fire. The air to feed the fire may come from an opening in the external wall, by a tube concealed behind the wainscot. In the case where it was first tried, a useless chimney happened to pass by the side of the fire-place, and a brick taken from between them, gave admittance to the air. In whatever way the object be accomplished, we should have it in our power to admit more or less air, so as to regulate the combustion at will, as in the common furnace. The room may be ventilated by a small opening near the ceiling, either into the chimney or into the stair-case, to be made to open, and close, to the degree required. The heated air tubes now commonly connected with fire-places, are peculiarly adapted to this plan, and with it produce the greatest possible saving of fuel; and the method of supplying coal to the fire from below it, or in any other way that secures the combustion of the inflammable gases contained in the coal, which I hope may soon become general, has the same utility here as in other cases.

The advantages of the plan may be shortly enumerated as follows:

1. The nearly perfect uniformity of temperature in the air through-

out the room, renders it a matter of indifference in what part the company sit.

2. The total prevention of draughts, or currents of air, which are inevitable in our rooms, as now warmed, because the fire must be supplied with air from the doors or windows. It is almost needless to mention, that a great portion of the winter diseases of this climate, are occasioned by these currents acting partially on our heated bodies.

3. The saving of fuel. Less than half the usual quantity will generally be found to keep the apartment in the most comfortable state.

4. The raising the temperature of the house generally; for were all the chimneys thus closed with respect to the apartments, although fires were lighted but in a few, any degree of heat once generated in the house would be long retained.

5. It completely prevents smoke, or dust, a circumstance which alone renders it extremely valuable in many cases; and with it there is no danger of fire.

In these particulars are comprehended all the advantages of the close stoves of continental Europe, so superior to ours in economy, and in the degree and uniformity of the temperature produced, with what many will call a very great additional one, that of seeing the fire; and it avoids their disadvantage, of giving a burnt or sulphury odour to the air of the apartment. It should not be forgotten, that at a very moderate expense, the change described may be made on all our common fire-places. [*Journal of Sciences and the Arts.*

FOR THE FRANKLIN JOURNAL.

MECHANICAL JURISPRUDENCE.—No. IX.

BY PETER A. BROWNE, ESQ.

On the law of Patents for new and useful Inventions.

Having in the last number of these essays, treated of the *personal* qualifications of the patentee, the next points to be considered are the qualifications of the *invention*, or *discovery*.

They are four in number. 1. That of being the patentee's *own* invention or discovery.—2. That of being *new*.—3. That of being *useful*.—4. In England, that of being a *manufacture:* in the United States, that of being an *art, machine, manufacture*, or *composition* of *matter:* or, in both countries, that of being an *addition* or *improvement*.

It is a requisite of every patent issued under the authority of the United States, that the thing patented, should be the patentee's own *invention*, or *discovery*.

The Constitution of the United States, in the 8th section of the 1st article, declares, "that Congress shall have power to promote the progress of science, and useful arts, by *securing*, for limited times, to *authors* and *inventors*, the exclusive right to *their* respective writings and discoveries." It is to *secure*, not to *grant*, the right. A *grant*

implies a property in the thing granted in the grantor, or person making the grant: but the framers of the Constitution never meant to invest Congress with the private property which every citizen has in his own inventions and discoveries. The right, (as Judge Washington, in a case which will be hereafter quoted, justly observes,) is in the inventor, before the patent is granted. To *secure*, means only to protect, and insure, a pre-existing right. This, Congress might well do, by virtue of its *superintending power over* the property of the citizens. So, to *grant*, pre-supposes a legal right to convey the thing granted, to the grantee. But if the right belonged to the *community at large*, Congress could not grant it to an *individual*; for, as before shown, that would be to create an odious monopoly, inconsistent with the fundamental principles of our government. A careful examination of the acts of Congress, will satisfy us, that the constitutional provision has, in this particular, been *strictly* pursued.

The 1st section of the act of Congress, of the 21st February, 1793, enacts, that "when any person, or persons, being a citizen, or citizens of the United States, shall allege, that he or they have *invented* any new and useful art, machine, manufacture, or composition of matter," &c.

The allegation must be, that the applicant has *invented* the thing claimed to be patented.

So, in the 3d section, "Every *inventor*, before he can receive a patent, shall swear, or affirm, that he does verily believe, that he is the *true inventor*, or *discoverer*, of the art, machine, or improvement, for which he solicits a patent," &c.

The 6th section contains a proviso, that if the defendant, in any suit for invading a patent right, can prove that the patentee was not the *original discoverer*, judgment shall be rendered in his favour, and the patent shall be declared void. And, lastly, in the 10th section, "the District Court of the United States, where the patentee or his representatives reside, may, if it appears that the patentee was not the *true inventor*, or *discoverer*, enter judgment to repeal the patent."

It must be obvious, from the preceding quotations and remarks, that, in the United States, no patent for any discovery or invention, can be of any validity, unless the patentee is the *true* and *original inventor*, or *discoverer*.

Any attempt on behalf of any other person, to obtain a patent, is useless; it is worse than useless, it is *criminal*, if the applicant takes the oath required by the 3d section of the act of Congress.

Whether, in England, any one, who is not the inventor, can take out a valid patent, must depend upon the statute of 21 James the first, and a sound construction thereof. The statute enacts, "that all monopolies, and all commissions, grants, licenses, charters, and letters patent, to any person or persons, bodies politic or corporate, whatsoever, of or for the sole buying, selling, making, or working, or using, any thing within this realm, or Wales, or of any other monopolies, and all proclamations, inhibitions, restraints, warrants of assistance, and all other matters, whatsoever, any way tending to the instituting, strengthening, furthering, or countenancing the same, or

any of them, are altogether contrary to the laws of the realm, and so are, and shall be *utterly void and of none effect*, and in no wise to be put in execution."

The 6th section of the statute then provides, that "no declaration in the statute mentioned, shall extend to any letters patent, and grants of privileges, for fourteen years, or under, of the sole working or making of any manner of new manufactures, within this realm, *to the* TRUE *and* FIRST INVENTOR, *and* INVENTORS, of such manufactures, which others, at the time of making such grant, shall not use; so, also, they be not contrary to the law, nor mischievous to the state, by raising the prices of commodities, nor generally inconvenient; the said fourteen years to be accounted from the date of the first letters patent, or grant of such privileges, but that the same should be of such force, as they should be if the said act had never been made, and of none other."

The rules for the construction of statutes, require, that *technical terms*, or terms of art, shall be taken according to their acceptance by the learned in such art; and that words *not technical*, shall be interpreted after their most usual and common acceptation. I believe it will be immaterial, which of these rules shall be applied, in the interpretation of the word "*inventor*," in the above proviso: for it has been used in the arts precisely in the same sense as in common parlance, namely, to describe one who *devises*, or *contrives*, or *discovers* something. It corresponds with the French word "*inventeur*," which is defined to be "*celui qui trouve quelque chose de nouveau, par la force de son imagination.*"*

That this was the sense in which the word inventor was understood, at the time of the passing of the act of Parliament, will appear from the circumstances, that Sir Edward Coke, who was in Parliament at the time this act passed, who was chairman of the committee to which the bill was referred, and who, of course, was fully competent to explain its meaning and intent, has given it a construction in the 3d volume of his Institutes. In page 184, he says, "It must be granted to the *first* and *true inventor*." It is matter of surprise, that the plain and intelligible words of the statute should ever have been construed to entitle any one but the *inventor* to take a patent: but so it is.

In the 4th year of James the second, the patentee of a horizontal mill, instituted a suit, in the King's Bench, to recover damages against one, who, it was alleged, had invaded the patent; and, upon the trial of that cause, the judges, Holt and Pollexfen, are represented as having said, "that if the invention be new in England, a patent may be granted, though the thing was practised beyond sea before; for the statute speaks of new manufactures within the realm; so that if they be new *here*, it is within the statute; for the act intended to encourage new devices, useful to the kingdom; and *whether learned by travel, or study, is the same thing*." 2 Salkeld's Reports, 447. Edgeberry *v.* Stevens.

* He who finds out something new, by the powers of his own conception.

Upon the authority of this case, Hawkins, in his Pleas of the Crown, b. 1. c. 79. s. 23. lays down the law to be, that a patent, granted for an *old invention*, IMPORTED into England from abroad, is good, provided it be entirely new in the kingdom. And C. J. Eyre, in delivering his opinion in the case of Boulton *v.* Hull, 2 Henry Blackstone's Reports, 491, says, that "the above case establishes, that the *first introducer* of an invention practised beyond sea, shall be deemed the *first inventor*." And Mr. John Davis, of the Rolls Chapel office, who, in 1816, made a collection of the most important English cases respecting patents of invention, to which are added some practical observations, remarks, that "the above decision is, at this day, acted upon to a great extent, as many patents are granted to persons resident in England, for inventions *communicated* to them from abroad, it being only considered necessary, under the words of the statute, that they should be new within this realm."

It may perhaps be considered presumptuous in me to call in question a position *apparently* so well supported by authority, and so long sanctioned by practice. But when we are in search of truth, we must be careful not to sacrifice *principle*, at the shrine of *great names*. I shall therefore, with due deference, proceed to inquire into the propriety of the rule.

I propose to show, *that the position is directly at variance with the plain words of the statute*. The statute confines the patent to the *true* and *first inventor*. The position is that it shall be granted to the *importer* or *introducer*.

The case relied on does not support the position. It would seem from the report, that the decision did not at all turn upon the words "true and first inventor," but upon the words of the statute, "new manufactures within this realm;" for the case states, that if the invention be new in England, a patent may be granted, though the thing was before practised beyond sea. This is the decision. It is in a subsequent part of the case, which professes to give, not the decicision, but, the reason for the decision, that the words are to be found that are relied on. The decision may be very sound, and the reason unsound.

The report is not entirely to be depended on.

1st. Because it does not appear to have been heard, or taken down, by the reporter in whose book it is found. William Salkeld's 2d volume of Reports, professes to contain cases decided, from the 1st year of William and Mary, to the 10th year of Anne. This case occurred in the 4th year of James II. The cases are arranged, according to the subject, in alphabetical order, and this case is the only one on "monopoly."

2nd. The report, itself, is not sufficiently full, and is confused. It ought to have stated, whether the plaintiff was, or was not, the *inventor;* but this is no where stated in the case. And it connects together, in a confused manner, two questions, in their nature entirely distinct, viz. the question, *who was the inventor*, and the question, *whether the invention was new.*

3d. It is differently reported in another book, in Comberbach's

Reports, page 84. It appears from that report of the case, that the *plaintiff was the inventor;* and the question agitated, was, whether he, *being the inventor*, could have a valid patent for what was new in the realm, but was used beyond sea; and it was decided, that he could: but the expression imputed to the judges, in the report in Salkeld, viz. "that whether learned by *travel*, or study, is the same thing," is no where to be found in Comberbach.

The material parts of the case, as reported by Comberbach, are as follows: "The plaintiff declares, *that he was the first inventor* of the horizontal mill, for which he had letters patent for fourteen years; and that, notwithstanding which, the defendant made another mill, like, &c. and damage, &c. Verdict for the plaintiff. Objection, notwithstanding it might be used beyond sea? Answer, admitting that, yet it shall be good, and within the statute, for that speaks only of new manufactures within this realm, which Halloway agreed."

What does this case decide? That the *first inventor* may have a patent for what is new in the kingdom, though it was previously used beyond sea; but it does not decide, that the *introducer*, or *importer*, shall enjoy any such privilege.

4th. After a careful search, I have not been able to find any subsequent English *adjudication*, establishing this position. C. J. Eyre's assertion is only an *obiter dictum*, and, I think, a hasty one.

5th. *So far as the point has been judicially noticed, in England, it has been negatived.*

The King *v.* Arkwright. June 25, 1785.

This was a scire facias, out of Chancery, to repeal the patent of Mr. Richard Arkwright, for an invention of certain machines for preparing silk, cotton, flax, and wool, for spinning.

One of the allegations in the scire facias was, that the same was not invented and found out by the said Richard.

Mr. Bearcroft, on behalf of the prosecution, said, But if this was a new invention, it was not Mr. Arkwright's; it was the invention of a very poor man, then alive, who would be produced. He communicated it, as a great secret, to another man, who sold it to Mr. Arkwright; therefore, it was not Mr. Arkwright's invention.

Mr. Adair, for the defendant, said, the originality of the invention had never before been disputed. He stated one of the questions to be, "whether Mr. Arkwright was, or was not, the *inventor.*" He further admitted, that if *any one* of the issues was found against Mr. Arkwright, it was the same as if the whole were. Mr. Bearcroft, in reply, contended, that three propositions were made out, every one of which destroyed the validity of the patent; one of which was, that Mr. Arkwright *was not the inventor.*

Witnesses were examined on both sides, the object of whose testimony was to ascertain, whether, in point of fact, Mr. Arkwright *was the inventor.*

Mr. Justice Buller stated, that the case was of great importance. That one of the questions was, whether the machinery was *invented* by the *defendant.* The Judge then stated the evidence on this head, on the one side and the other, and concluded as follows: "Gentlemen.

thus the case stands, as to the several component parts of this machine; and if upon them you are satisfied, none of them were inventions unknown at the time this patent was granted, or *that they were not invented* by the defendant, upon either of these points, the prosecutor is entitled to your verdict. If upon *any* point, you are of opinion with the prosecutor, you will find a verdict for him. If upon *all* the points, you are of opinion for the defendant, you will find a verdict for him."

The verdict was against the defendant; a new trial was moved for, but no allegation was made of a misdirection in point of law.

In 1789, Hayne and another, pretending to derive a right under a patent of one Tayler, assigned to Maltby part of that right on certain terms. An action was brought upon the article of assignment, and one defence set up was, *that the invention was not discovered by Tayler, the patentee.* It was not pretended by the counsel for the plaintiff, that Tayler's patent was valid; but they relied upon the argument, that the defendant, by his covenant, was estopped from the allegation, that it was void. But judgment was given for the defendant. Ashhurst, J. says, "The plaintiffs use this patent as a fraud on all mankind; and they state it to be an *invention of the patentee*, when, in truth, it was *no* invention of his. The only right conferred on the defendant by this agreement, was that of using this machine, which was no more than that which he, in common with every other subject, has, without any grant from the plaintiffs." 3 Term Reports, 438. Hayne *v.* Maltby.

Tenant's case, tried before Lord Ellenborough, in 1802, was this: Mr. Tenant brought his action for an infringement of his patent for a bleaching liquor; several witnesses were called in support of the patent, who proved the great utility of the invention, and the general ignorance of the bleachers, with respect to such bleaching liquor, until after the date of Mr. Tenant's patent. On the other side, a chemist deposed, that he had suggested to Mr. Tenant, that he would probably attain his end in bleaching, by keeping the lime-water constantly agitated. Mr. Tenant afterwards informed the witness, that this method had succeeded. The conversations took place in 1796, and Mr. Tenant's patent was taken out in 1798. Lord Ellenborough declared this to be a scandalous patent, equally unfounded in law and justice. The plaintiff was non-suited on two grounds, one of which was, that a chemist had suggested to Mr. Tenant the agitation of the lime-water, which was indispensable in the process, and, therefore, *that it was not the invention of the patentee.*

To this may be added, that in all the best English precedents of declarations for infringing a patent right, the declaration states, that the plaintiff *is the inventor.* See 2 Chitty's Pleading, 320*. "For that whereas the said A. B., before and at the time of making of the letters patent, and of the committing of the grievances by the said E. F., as herein before mentioned, *was the true and first inventor* of a certain," &c.

These are the reasons, and authorities, which have induced me to *doubt* the rule, as laid down by Hawkins, and C. J. Eyre, that the

importer, or *introducer*, can obtain a valid patent, and to suspect, that the practice mentioned by Mr. Davis, for persons in England to take out patents for inventions *communicated from abroad*, will not stand the test of judicial investigation. Believing this to be the law, and knowing that the expenses of taking out a patent, in England, are very considerable, I would not encourage any American to apply for a patent there, *unless he is the* INVENTOR.

On polishing Wood, Ivory, Horn, Tortoise-shell, &c. By the Editor.

An article upon this subject, furnished by those excellent workmen, Messrs. HOLTZAPFEL and DYERLEIN of London, appeared in the 2nd volume of the Technical Repository; some of the information contained in that paper, will be found among the following observations, together with some that is original, and, as we believe, better than the methods there described. Where we have borrowed, the inverted commas will mark the fact.

"*Directions for polishing in the Lathe.*

"*Good work* does not require much polishing, for the beauty of it depends more on being executed with tools properly ground, set, and in good order: the work performed by such tools will have its surface much smoother, its mouldings and edges much better finished, and the whole nearly polished; requiring, of course, much less subsequent polishing, than work turned with blunt tools. (This is often the case in that done by amateurs and workmen who have not proper conveniences for grinding and setting their tools.)

"One of the most necessary things in polishing, is cleanliness: therefore, previous to beginning, it is as well to clear the turning-lathe, or work-bench, of all shavings, dust, &c. as also to examine all the powders, lackers, linen, flannel, brushes, &c. which may be required; to see that they are free from dust, grit, or any foreign matter. For further security, the polishing powders used, are sometimes tied up in a piece of linen, and shaken as through a sieve, so that none but the finest particles can pass.

"Although, throughout the following methods, certain polishing powders are recommended, for particular kinds of work, it must be understood, that there are others, applicable to the same purposes, the selection from which, remains with the operator; only observing this distinction, that when the work is rough, and requires much polishing, the coarser powders are best; but, on the contrary, the smoother the work, the less polishing it requires; consequently, the finer powders, in the latter case, are preferable.

"*Directions for polishing soft wood.*

"Soft wood, though nearly the most difficult material, may be turned so smooth, as to require no other polishing than that produced by holding against it a few fine turnings or shavings of the same wood whilst revolving, this being often sufficient to give it a finished ap-

pearance: but when the surface of the work has been left rough, it must be rubbed smooth with polishing paper, constantly varying the position of the hand, otherwise it would occasion rings or grooves (if they may be so called) in the work."

"When the work has been polished with the lathe revolving in the usual way, it appears to be smooth; but the roughness is only laid down in one direction, and not entirely removed, which would prove to be the case by turning the lathe the contrary way, and applying the glass-paper; on which account, work is polished best in a pole-lathe which turns backwards and forwards alternately; and therefore it is well to imitate that motion as nearly as possible."

Mahogany, walnut, and some other woods, of about the same degree of hardness, may be polished by either of the following methods. Dissolve by heat, so much bees-wax, in spirits of turpentine, that the mixture, when cold, shall be of about the thickness of honey. This may be applied either to furniture, or to work running in the lathe, by means of a piece of clean cloth, and as much as possible should then be rubbed off by means of a clean flannel, or other cloth. Bees-wax alone is often used; upon furniture it must be melted by means of a warm flat-iron; but it may be applied to work in the lathe, by holding the wax against it, until a portion of it adheres; a piece of woolen cloth should then be held upon it, and the lathe turned very quickly, so as to melt the wax; the superfluous portion of which may be removed by means of a small piece of wood or blunt metal, when a light touch with a clean part of the cloth, will give it a gloss; shell-lac varnish, applied in the manner described under the head of French polish, in page 153 of this volume, is a very superior mode; and although it requires a little more address than the other methods, a very little practice will render it quite easy. A very good polish may be given to mahogany, by rubbing it over with linseed oil, and then holding against it a cloth dipped in fine brick-dust. Formerly, nearly all the mahogany furniture made in England, was polished in this way.

Hard woods.

These, from their nature, are readily turned very smooth; fine glass paper will suffice to give them a very perfect surface; a little linseed oil may then be rubbed on, and a portion of the turnings of the wood to be polished, may then be held against the article, whilst it turns rapidly round, which will in general give it a fine gloss. Sometimes a portion of shell-lac, or rather of seed-lac varnish, is applied upon a piece of cloth, in the way formerly described.

"*Hard wood ornamented or engine-turned.*

"The polish of all ornamental work, wholly depends on the execution of the same, which should be done with tools properly sharpened; and then the work requires no other polishing but with a dry hand brush, to clean it from shavings or dust, this trifling friction being sufficient to give the required lustre."

Ivory and Bone, either plain or ornamented.

Ivory or bone, admits of being turned very smooth; or when filed,

may afterwards be scraped, so as to present a good surface. They may be polished by rubbing them first with fine glass paper, and then with a piece of wet linen cloth, dipped in powdered pumice stone; this will give a very fine surface, and the final polish may be produced by washed chalk, or fine whiting, applied by a piece of cloth, wetted in soap-suds. Care must be taken in this, and in every instance where articles of different fineness are successively used, that previously to applying a finer, every particle of the coarser material, be removed; and that the rags be clean, and free from grittiness.

Ornamented work must be polished with the same materials as plain work; using brushes instead of linen, and rubbing as little as possible; otherwise, the more prominent parts will be injured. The polishing material should be washed off with clean water; and when dry, may be rubbed with a clean brush.

Horn and Tortoise shell.

These substances are so similar, in their nature, and texture, that they may be classed together, as regards the general mode of working and polishing them. A very perfect surface is given by scraping; the scraper may be made of a razor-blade, the edge of which should be rubbed upon an oil stone, holding the blade nearly upright, so as to form an edge like that of a currier's knife; and which like it, may be sharpened by burnishing; work when properly scraped, is prepared for polishing; to effect this, it is first to be rubbed with a buff made of woolen cloth, *perfectly free from grease*; the cloth may be fixed upon a flat stick, to be used by hand; but what the workmen call a *bob*, which is a wheel running in the lathe, and covered with the cloth, is much to be preferred, on account of the rapidity of the operation; the buff is to be covered either with powdered charcoal and water, or fine brick-dust and water; after the work has been made as smooth as possible with this, it is followed by another buff, or bob, on which washed chalk, or dry whiting is rubbed; the comb, or other article to be polished, is moistened slightly with vinegar, and the buff and whiting will produce a fine gloss, which may be completed by rubbing it with the palm of the hand, and a small portion of dry whiting, or rotten-stone.

ON JAPANNING AND VARNISHING.—No. 4.

BY THE EDITOR.

Improved mode of applying the varnish in the French polish.

To the information given in our last number, on the subject of the French polish, we add the following improvement, made by Mr. Samuel Nock, and published in the Technical Repository.

"This improvement consists in the substitution of a sponge, with a smooth surface, in place of the coil of list of woolen cloth, or drugget, commonly used.

"Mr. Nock finds the sponge to be far more convenient, for applying the varnish to the surfaces of gun-stocks, than the list, or drugget; as it has no loose hairs, like the latter articles, which are continually protruding through the linen cloths, in which they are inclosed, to the great injury of the process. He also finds, that he can fill the sponge at once with a considerable quantity of the varnish; and can bring it to the surface of the linen cloth, when required at any time, by squeezing the sponge; and he is thus enabled to continue the operation for a much longer time, without renewing the varnish.

"When the sponge becomes clogged with varnish, he moistens it with alcohol; and, putting a coarse linen cloth over it, employs it to prepare the gun-stocks for receiving the varnish; as, also, to remove any former varnish, oil, &c. He, however, always employs a fine linen cloth, in finishing his varnishing.

"He adds, that a Frenchman of his acquaintance, has informed him, that in France, they find the introduction of camphor to improve the varnish."

On Lacker for Brass, &c.

Although, as we have elsewhere observed, the term lackering, is applied to every kind of varnishing performed with lack, yet it is more commonly employed to indicate that process in varnishing, by which the colour of brass is heightened, so as to appear more like gold, or by which a similar colour is given to tin, or leaf silver. In our next number, we will describe the methods by which brass is cleaned, polished, and prepared for lackering; at present, our attention will be given to the mode of preparing and applying the lacker.

To make Gold lacker.

Take seed lack, and carefully pick out the impurities from the clear grains, and, if thought necessary, wash these in clear water, and afterwards dry it perfectly. About three ounces may then be put into a pint of well rectified alcohol; this mixture should be kept in a warm room, and frequently shaken, during two or three days. The whole of the lac will not dissolve, but a sufficient quantity will combine with the alcohol, for the purpose intended. It is best not to strain it through a cloth, but to allow it to stand until the impurities have subsided, and the varnish becomes transparent, when it should be carefully decanted into another bottle. This clearing will require three or four days, and sometimes more, according to the thickness of the varnish. When it is wished to preserve the brass nearly of its natural colour, and merely to prevent its tarnishing, the lacker is used without any additional colour; this, however, is rarely the case, colouring materials being usually added.

Various pigments have been used to tinge the lacker; they are all such as are soluble in alcohol, and the only colours employed, are yellow and red.

Yellows are produced by gamboge, or turmeric root in powder; reds, by arnotta, or by dragons-blood, (*sanguis draconis,*) saffron is

also sometimes used for the same purpose. A dram of either of these, may be put into an ordinary vial, and a couple of ounces of alcohol poured on; this will dissolve a portion of the colouring matter, which when clear, may be mixed with the varnish. We have tried all the materials, and prefer the turmeric, and dragons-blood; a few drops of each of these may be put into the lacker; using a larger portion of the turmeric, if a yellow colour be preferred, and of the dragons-blood, if the red is to predominate. It is best not to colour the varnish very highly at first, as it may then be altered according to the nature of the work.

Lacker for tin, or silver leaf.

The only difference in this lacker, and that intended for brass, is that it is more highly coloured, as it is intended to give a gold colour, to a white metal. Many articles, commonly supposed to be gilt, are covered with silver leaf, and afterwards lackered, and when well done, the deception is perfect. When, what was called, gilt leather, was in fashion, it was generally covered in this way.

Directions for using the Lacker.

The lacker, properly coloured, is to be poured into a tin, or earthen cup, a common tea cup, fixed on a block of wood, to cause it to stand firmly, will answer the purpose. It is convenient to have a wire fixed across the cup, just below the rim, in order to scrape the superfluous lacker from the brush. The brushes should be of the flat kind, excepting for small work; they are made of camel's hair, inclosed in tin, with cedar handles, and may be purchased at most of the druggists. The brass to be lackered, must be perfectly bright and clean, the room must be free from dust; a clean piece of linen rag must be at hand, to wipe the work before it is varnished; the sooner it is lackered, after it is finished, the brighter it will be, as polished brass, exposed for an hour or two, will be sensibly tarnished. When it is not convenient to lacker soon after polishing, it is the practice of some workmen to pass the lacker brush once over the article, cold, which prevents the contact of the air; the dull appearance which this produces, is removed in the subsequent operation.

The brass to be lackered, must be heated upon a stove, or in any other convenient way; the degree of heat must not be so great as to render it difficult to hold the work in the hand, nor should it be far below this. The brush is to be dipped in the varnish, and then scraped upon the wire, or upon the edge of the cup, to remove a considerable portion of its contents, otherwise it cannot be laid on evenly. The size of the brush may vary with the work, but one of more than an inch and a half, will rarely be found convenient to use. In laying on the varnish, the brush should always be passed completely from one end of the work to the other, and never backwards and forwards, as in painting, otherwise the lackering will be irregular, and in streaks; nor must it be passed a second time over the same part, until the previous coat is dry; a few seconds, however, suffices for this, when the brass is properly heated. Two or three coats will answer

for most work, nor are more than four or five, ever requisite. Work that is thick, will retain heat enough to be finished at one operation; that which is thin, must be heated between every coat. If the varnish is too thick, it will always dry in streaks; a little alcohol is an evident remedy.

Work that is turned and polished in the lathe, may be so heated by the friction, as to be much more conveniently lackered, than when heated in any other way.

The foregoing directions apply only to smooth work, such as is either polished or burnished. Chased, or wrought work, such as leafing, &c. cannot be lackered with the kind of brush before described; one with fine, stiff hairs, called fitch-hair, is used, and this, instead of being passed over the article, is dabbed on, until the surface is regularly covered.

The most careful workmen do not return the lacker from the cup, into the bottle, but pour it into another, where it is allowed to accumulate, and to settle, when it will be as good as at first.

When the lackering is finished, the brush may be scraped upon the wire, and afterwards wiped by pressure between paper. This will be found better than washing it in alcohol, as by allowing it to dry with a little varnish in it, the hairs get a set, which prevents them from straggling, a point of much importance. A few minutes soaking in the lacker, will render it fit for use.

We have repeatedly performed the processes above described, and have now by us, articles which have been lackered nearly eighteen years, which have preserved their colour, and appear equal to any similar work we have ever seen.

Fine Black Colour.

TO THE EDITOR OF THE FRANKLIN JOURNAL.

Sir—Having, some time since, discovered a method of producing the finest black imaginable, and knowing that your valuable Journal is a receptacle for any improvement in the arts, I send you the following recipe.

Take some camphor, and set it on fire; from the flame will arise a very dense smoke, which might be collected in the same way as the lamp-black, in the manufactories of that article. As I have not required much at a time, I have generally collected it on a common saucer, by holding it over the flame. This black, mixed with gum arabic, is far superior to any India ink I have ever seen imported; I have also used it ground in oil.

Yours, &c. T. V. Peticolas.

Nashville, Tenn. Aug. 1st, 1826.

Miniature painters, who use colours in small quantities, sometimes obtain a most beautiful and perfect black, by using the buttons which form on the snuff of a candle, when allowed to burn undisturbed.

These are made to fall into a small thimble, or any other convenient vessel which can be immediately covered with the thumb, to exclude the air. This is found to be perfectly free from grease, and to possess every desirable quality. [*Editor.*

FRANKLIN INSTITUTE.

Committee of Inventions, September 4th, 1826.

The committee of inventions having had referred to them for examination, an auger for boring holes, either square, or of any other desired form, invented by Mr. H. Branch, of the state of New York, and for which he has obtained a patent from the United States,

Report,

That they have carefully examined the instrument, and that it consists of an auger, formed like the ordinary American screw-auger; that the twisted part of the auger is enclosed in a case or socket, extending from the upper part of the twist, to the cutting edge; allowing the small entering screw only, to project beyond it. The external form of the socket is either square or otherwise, according to the intended shape of the hole to be bored, a large portion of its sides being cut away, to allow the chips to escape. The lower end of the socket is of steel, with a sharp cutting edge, bevelled towards the inside. The cutting edges are not allowed to terminate in right lines, but are made concave, so as to admit the angular points to enter the wood first; this causing it to cut with greater ease, and more smoothly than it otherwise would.

The upper part of the socket forms a collar, which works freely on the shank of the auger, just above the twisted part, and is retained in its place by a pin, and other appendages.

When a longitudinal hole, or mortice, is wanted, two or more augers are placed side by side, furnished with their appropriate sockets, and retained in their places by obvious contrivances.

But few instruments have fallen under the observation of the committee, so completely adapted to the attainment of its object; it is at once perfectly simple in its construction, and efficient in operation, boring a square hole, with well defined angles, with nearly the same rapidity, as a round one of the same diameter, and forming it with a degree of truth unattainable by the ordinary methods.

The committee have never seen described, or in use, any instrument, upon the same principle, or which can in any way interfere with it, as an original invention.

By order.

THOMAS P. JONES, *Secretary.*

Improvements in manufacturing paper, and also in type founding.

TO THE EDITOR OF THE FRANKLIN JOURNAL.

Sir—I some time since received a letter, from a relative in Edinburgh, giving some account of Messrs. Cameron & Son's improved machine for manufacturing paper; the letter is accompanied by a printed prospectus, setting forth the great advantages resulting from its use. The price of a machine, complete, is 500 guineas, and the amount of saving in one year, is stated to be £640 8*s.* sterling.

A single machine, is sufficient for a mill of four vats. It produces, in 12 hours, 15 reams of the largest size news, 30 reams of demy, or crown, and 60 of foolscap, or pot paper. It produces a firm, smooth, level paper, of uniform thickness, and perfectly free from air bubbles, water drops, or hemming; exactly square, and with edges nearly as fine as if cut; it is made, sheet by sheet, upon moulds; it comes so dry from the machine, that it will immediately bear any degree of pressure, and will, consequently, dry in about half the time required for paper made in the ordinary way.

The stuff is worked cold, which not only removes the risk of fire, but produces a much higher shade of colour, whilst there is a degree of cleanliness, not attainable in the ordinary process of manufacture.

The patentees state, that no description, or drawing, could convey any idea of its utility and perfection; and that to be judged of, it must be seen at work.

The writer of the letter has seen it in operation, and says, that it completely justifies the foregoing account. The complexity of the machine, and his want of skill in drawing, prevented his giving an intelligible description of its construction; all that I can gather from his account, is, that a number of frames are carried round in the trough, by an endless chain; and that at a particular part of the operation, the frames cant themselves over, and the paper is received between two felts, which then pass through rollers, when the paper is delivered nearly dry.

I have also received from Messrs. Didot, Legrand, & Co. of Paris, a notice of their Polyamatype Foundry. The improvement consists in casting at once, a great number of letters, from 100 to 160, according to the size of the type.

Two workmen of ordinary address, will fill the mould three hundred times in a day, and can, consequently, cast from 30 to 48,000 letters, or 40,000, on an average. This is said to be equal to the work of from 12 to 15 men, upon the old plan.

The letters are pronounced to be uniformly more perfect, than those formerly produced.

So great is the saving by this process, that the manufacturers state their prices to be 30 per cent. below those of other founders in Paris, although the latter sell 30 per cent. cheaper than the London prices.

Very respectfully, yours, A.

Notice of the Glass Blowing, Cutting, and Porcelain Manufacture, at Jersey City. By the Editor.

In a recent visit to New York, we crossed to Jersey City, to examine the manufactories of glass, and china, which are established there. Although we had heard them spoken of in this city, we had not formed any correct idea of their extent, and importance. When these works were first established, strangers were freely admitted; but the workmen were so much interrupted by the idle curiosity, and aptitude at meddling, displayed by many of the visitants, that it has been found necessary to close the doors, excepting an order be obtained from the managers.

The glass house has two principal departments, one for the blowing, and the other for cutting. The former, is under the direction of Mr. Glaze, the latter, under that of Mr. Young. Most of the glass that is blown, is intended to be cut; it is remarkably clear and colourless, and free from veins and blebs; and the forms given to their pitchers, vases, dishes, and other articles, are in very good taste.

The cutting room exhibits a scene of active industry, combined with the most perfect order, resulting, in part, from the neat and judicious arrangement of the machinery, but, undoubtedly, in a still higher degree, from the excellent management of its conductors. There are in one room, thirty-two wheels for cutting, the whole of which are driven by a steam engine. Twelve other wheels are in preparation, which are to be fixed in another room, and to receive their motion from the same source. Every wheel was occupied, and although the establishment is of comparatively recent origin, there is an appearance of maturity about it, that augurs well.

The specimens which we examined, and these were not few, were cut with great regularity, and well polished. Some of the best, we were assured by the superintendant, were, both in design and execution, the work of boys who had been but a few months at the business.

The porcelain manufactory is under the direction of Mr. Shirley, a gentleman brought up to that business in England, and who has also spent a considerable portion of time in France, making himself acquainted with the methods pursued in that kingdom. He has under his direction, workmen from both countries. The ware is much superior to any thing we had expected to find there. The principal articles which we saw, were either of white biscuit, or of white and gold, in the French style. The texture, and the colour, are equal to that of the china imported from France; the surface clear and regular, and the gilding, in general, well done. We have in our possession, a custard cup, taken at random, from a number, which will justify these remarks. We hope to see specimens from both establishments, at the approaching exhibition of the Franklin Institute.

The glass works, we believe, belong entirely to Messrs. George Dummer & Co. of New York. The porcelain establishment is also owned, in great part, by them, the shares into which the stock is di-

vided, not having been taken up. In consequence of this, the business does not appear to be carried on with the same spirit as that of the glass works; and we were, somehow, impressed with an idea, that it does not give the same promise of permanence: we, however, were very transient observers, and hope, that, in this instance, we were more moody than correct.

We also made a flying visit to Albany; and the only mechanical trophy which we brought away with us, is a wrought iron spike, made by machinery, at the works of the Messrs. Townsend, near that city. The rapidity with which they are made, is astonishing, and they are preferred by the ship builders, to those made by hand. We had not time to visit the works, and therefore cannot speak more fully upon the subject; we ascertained, however, that they are formed by pressure.

NATURAL HISTORY.

THE PRAIRIE OR BARKING WOLF.*

Canis Latrans; Say.

Canis Latrans: Say. Long's Expedition to the Rocky Mountains, vol. i. p. 168. A well prepared specimen in the Philadelphia Museum.

This wolf frequents the prairies, or natural meadows of the west, where troops or packs containing a considerable number of individuals are frequently seen following in the train of a herd of buffalo or deer, for the purpose of preying on such as may die from disease, or in consequence of wounds inflicted by the hunters. At night they also approach the encampments of travellers, whom they sometimes follow for the sake of the carcasses of animals which are relinquished, and by their discordant howlings, close to the tents, effectually banish sleep from those who are unaccustomed to their noise. According to Say's observation, they are more numerous than any of the other wolves which are found in North America.

The barking wolf closely resembles the domestic dog of the Indians in appearance, and is remarkably active and intelligent. Like the common wolf, the individuals of this species, frequently unite to run down deer, or a buffalo calf which has been separated from the herd, though it requires the fullest exercise of all their speed, sagacity and strength, to succeed in this chase. They are very often exposed to great distress from want of food, and in this state of famine are under the necessity of filling their stomachs with wild plums, or other fruits no less indigestible, in order to allay in some degree, the inordinate sensations of hunger.

This wolf barks in such a manner as to resemble the domestic dog very distinctly; the first two or three notes are not to be distinguished from those produced by a small terrier, but differs from that dog by adding to these sounds a lengthened scream. On account of this habit

* From Godman's American Natural History.

of *barking*, Say has given the specific name of "latrans" to this wolf, which we prefer to translate for a trivial name, instead of using that of "*prairie* wolf" which is equally applicable to other species.

In confirmation of the sagacity of this wolf we shall quote from Say, to whom we owe all that has yet been made known of this species, some anecdotes respecting it. "Mr. [Titian] Peale constructed and tried various kinds of traps to take them, one of which was of the description called a "live trap;" a shallow box reversed and supported at one end by the well known kind of trap-sticks, usually called the "figure four," which elevated the front of the trap upwards of three feet above its slab flooring; the trap was about six feet long, and nearly the same in breadth, and was plentifully baited with offal. Notwithstanding this arrangement, a wolf actually burrowed under the flooring, and pulled down the bait through the crevices of the floor: tracks of different size were observed about the trap. This procedure would seem to be the result of a faculty beyond mere instinct."

"This trap proving useless, another was constructed in a different part of the country, formed like a large cage, through which the animals might enter, but not return; this was equally unsuccessful; the wolves attempted in vain to get at the bait, as they would not enter by the rout prepared for them. A large double "steel trap" was next tried; this was profusely baited, and the whole with the exception of the bait was carefully concealed beneath the fallen leaves. This was also unsuccessful. Tracks of the anticipated victims were next day observed to be impressed in numbers on the earth near the spot, but still the trap with its seductive charge, remained untouched. The bait was then removed from the trap and suspended over it from the branch of a tree; several pieces of meat were also suspended in a similar manner from trees in the vicinity. The following morning the bait over the trap alone remained. Supposing that their exquisite sense of smell warned them of the position of the trap, it was removed and again covered with leaves, and the baits being disposed as before, the leaves to a considerable distance around were burned; and the trap remained perfectly concealed by ashes; still the bait over the trap was avoided."* It was not until a log-trap was used, that an individual of this species was caught. This log-trap is made by raising one log above another at one end by means of an upright stick, which rests upon a rounded horizontal trigger on the lower log.

The barking wolf is about three feet and a half in length, of which the tail forms thirteen and a half inches, exclusive of the hair at its extremity. The ears are four inches long, from the top of the head: and the distance from the anterior canthus of the eye, to the end of the snout, is three inches and three-fourths.

The general colour of the barking wolf is cinereous, or gray, intermingled with black, and dull fulvous, or cinnamon, above. The hair is of a dusky lead colour at base; of a dull cinnamon in the middle of its length, and gray, or black, at tip, being of greater length along

* See Journal of Long's Expedition to the Rocky Mountains, vol. i. p. 168.

the middle of the back than on other parts of the body. The ears are erect and rounded at tip, having the hair on the back part of a cinnamon colour, and dark plumbeous at base, while that on the inside is gray. The eyelids are edged with black; the superior eyelashes are black beneath, and on the superior surface of their tips. The supplemental lid is margined with black brown, before, and edged with black brown, behind. The iris is yellow, and the pupil of a black blue; upon the lachrymal sac, is a spot of black brown. The face is cinnamon coloured, tinted with grayish on the nose; the lips are white, edged with black, and have three series of black bristles. The colour of the head between the ears is an intermixture of gray and dull cinnamon; the colour of the sides is paler than that of the back, and faintly banded with black above the legs, which are cinnamon coloured on the outside, and more distinctly so on the posterior hair. The tail is straight, broad and bushy, of a gray colour, mingled with cinnamon above, and black at the tip. The extremity of the trunk of the tail reaches to the projection of the os calcis, when the leg is extended.

Different individuals exhibit very considerable variations in colouring, and hence many of the minute markings given by Mr. Say, in the above description, may not be found applicable. He states himself that other specimens which he saw differed much from his first description; one "was destitute of the cinnamon colour, except on the snout, where it was but slightly apparent; the general colour was therefore gray, with an intermixture of black, in remote spots and lines, varying in position and figure with the direction of the hair." Perhaps no two individuals could be found exhibiting throughout precisely the same arrangement of coloured markings.

Hancock's invention for cooling boiling worts in Brewing.

Wiveliscombe, Somersetshire, June 7, 1826.—Therm. 68°.

Sir—Through your extensively circulated publication, I would wish to communicate to your correspondents, and the public, an invention of a Mr. Hancock, a very ingenious and intelligent man, who has paid great attention to the art of brewing, and the mode by which its various processes may be condensed and facilitated. I visited Mr. Hancock's brewery this morning, and witnessed an experiment, which, to me, appears of vast importance to the science of brewing. It is agreed by all parties, that those who are engaged in extensive concerns of this description, find a considerable difficulty in reducing the temperature of their worts, to the point necessary for a perfect fermentation; but Mr. Hancock completely obviates these difficulties, by the following process:—A leaden pipe, three-quarters of an inch calibre, is encased in another leaden pipe of about double its diameter, and is inserted into the copper, or other vessel, containing the boiling liquor. These two pipes are coiled around the walls of the building, to preserve a plane of inclination, which will allow the wort, or liquor, in the minor pipe, to escape, at the rate of two hogsheads

per hour, and is let off by a stop-cock, whilst the space between the outer and inner pipe, is filled with cold water, which passes rapidly through it, and carries off the caloric of the boiling wort, or liquor, whose temperature is reduced two degrees below the measure of the atmosphere; thus effecting a diminution of temperature from 212° of Fahrenheit's thermometer, to 66°, and cooling at the rate of fourteen hogsheads in seven hours, which could not be effected in double that time by the usual process. We have here, an apparatus, bold, decisive, and simple; requiring no care, trifling labour, and not likely to be out of repair; and, what is of more consequence, of the cheapest materials. I have been informed, that some one has claimed a patent for a very complex machine, designed to cool boiling worts; but the simplicity of Hancock's apparatus, must supersede all others, liable to have their parts discomposed in the working. Mr. Hancock, who is most liberal in communicating his improvements to the public, will feel obliged by any of your correspondents communicating their sentiments to him, through the medium of your excellent publication.

I have the honour to be, sir, your obedient servant,

HENRY SULLY, M. D.

[*Lond. Mech. Mag.*

Account of the Process of MM. Thenard and Darcet, for Preserving Substances from Humidity.

On the 27th of February, 1824, there was read at the Academy of Sciences of Paris, a Memoir, by MM. Thenard and Darcet, on the employment of fatty bodies, for making coverings, and unalterable plasters, and for making moist places salubrious. This process, the effects of which have been established by several years experience, consists in causing a mixture of one part of oil, and two parts of resin, to penetrate, by means of an intense heat, either porous stones, or plaster. The bodies penetrated with this mixture, acquire afterwards a singular degree of solidity, and become absolutely impermeable to moisture.

This process may be employed, for rendering low and damp places salubrious. It was tried at the Sorbonne, and the expense of it was only 16 sous per square metre, or a square whose side is 39 English inches. The other objects, to which it is proposed to apply it, are houses, statues placed in the open air, bas reliefs and sculptures in plaster, the ceilings and walls of rooms intended for Fresco paintings, basins for holding water, and reservoirs for holding grain.

M. Thenard exhibited to the Academy, several objects of art, executed in plaster by his process. In order to show its efficacy, he exposed to the open air, for several years, a bas relief, half of which was formed of ordinary plaster, whilst the other half was prepared. This last half was perfectly preserved, while the other displayed visible traces of disintegration. This process does not resemble those which consist in covering bodies with a sort of skin, which keeps off humidity. The body is actually penetrated with the mixture, to the depth, sometimes, of several inches.

The Editor has commenced a more detailed account of the preceding process, as published in the *Annales de Chimie et de Physique*, for May last; but not having completed the translation of the article, its appearance is necessarily delayed until next month.

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*A fragment of Roman Glass, found near Brool.**

The invention of glass (says Dr. Rudolph Brandes) is known to be very ancient; nevertheless, few antique remains of it have come down to us, or have been analyzed.

Although the art of manufacturing glass was not carried to that degree of perfection among the ancients, to which it has been brought in our days, still, in some branches of it, they had gone very far, as has been sufficiently shown by the learned investigations of Winkelmann.

The piece of glass which I obtained from M. Dorow, was a fragment of a round vase, and weighed about ten grains. Its colour was of a milky white, with a very bluish cast. A pellicle of a brilliant gold colour, covered its exterior, and, in part, its interior surface. This had so much the appearance of gilding, that without a chemical trial, one would have taken it to be gold; but I shall show below, that this was not the case. The long period of time, during which the glass had been exposed to the effects of the air, water, and the pressure of the earth, had made a visible impression on it; so much so, that it was in a mouldering state, had entirely lost its firmness and brittleness, and when broken, pressed, or scraped, fell into small leaves, like mica. It had completely lost its transparency, but it was still evident, from its appearance in the centre, that it was originally perfectly transparent, that part, from having somewhat resisted the destructive effects that had acted upon the rest, being so still. Wherever the glass was covered with the gold-like pellicle, it was not transparent; but where free from it, it was perfectly clear.

By endeavouring to separate that covering, no gold-leaf was detached, but thin leaves of glass; and the surface beneath soon offered a similar appearance. In some places, that metallic tarnish assumed a fine bluish red, or green hue; and a similar appearance was produced, by taking off the apparently metallic pellicle which was on the inside. This shows, that the cause of this tarnish was the same as that which acts upon glass long exposed to the weather—such as in old church windows, for instance; and which has a similar appearance. However, to convince myself completely of the absence of gold, I heated as many as possible of the shining glass leaves, in nitric acid, by which process, the gold-coloured covering entirely disappeared, and the leaves remained without colour. The component parts of the glass, I found to be silica, soda, lead, oxide of manganese, oxide of iron, lime, and alumina. Of these constituents, the silica formed about two-thirds, and the other substance the remaining third of the whole mass.

* From Schweigger's Journal, Band. x. p. 304.

New Steam Carriage.

We have just had an opportunity of examining a steam carriage which has lately been constructed, in the most private manner, under the direction of Mr. Gurney, of Argyle-street, and which is now so near its completion, that a brief description of it, while it cannot fail to interest the public, to whose notice it is on the point of being presented, will scarcely be considered as unfair or injurious to the proprietor, by giving a premature publicity to his ingenious and original invention.

Considering the great weight and unwieldy character, generally, of ordinary steam machinery, perhaps the most remarkable particular connected with Mr. Gurney's new carriage, and that which will strike the observer with most surprise, is the extraordinary lightness and elegance of its external appearance. Looking at it with reference to the ordinary carriages at present in use among us, its appearance is something between that of the regular mail, and the common Telegraph stage-coach. Indeed it more nearly resembles those light carriages which are at present driven four in hand, by our young bloods in the Parks and about town, than any other vehicle with which we are acquainted. The body of it is not larger—it has the same kind of fore and hind boot, the same size box, dickey, &c. And, what is still more remarkable, it has, so far as relates to all the above particulars, nothing belonging to its appearance, which can distinguish it from one of the above carriages—nothing which they have not, or which can indicate that it is intended to be moved in any other than the ordinary manner. On looking however, before Mr. Gurney's carriage, at that spot which is in ordinary carriages occupied by the pole, &c. and also beneath it, we perceive in what it differs outwardly from others. Immediately in front, at about 7 or 8 feet in advance of the fore wheels, is placed an oblong box or boot, with a single wheel beneath it, and a dickey seat above it, out of which rises a high pillar. And underneath the body of the carriage, are several other pieces of machinery.

It is by means of these objects, that the carriage is moved, by the intervention of steam; not on the ordinarily understood principles of that power, but by contrivances and arrangements, that appear to be altogether new; since the whole weight of this machinery, for generating and applying the required steam, amounts to but one-twentieth part of that which has hitherto been considered as necessary; and without this relative weight of machinery, no successful attempt has yet been made to apply steam, practically, to the arts of life. The steam-machinery attached to this carriage, is estimated to possess, what is called, an eight horse power; and yet the weight of the whole, including the cylinders, (of which there are two, instead of one,) amounts to little more than about 500 pounds; whereas the ordinary weight of the machinery hitherto required to generate the above mentioned power, is not less than six tons. The diminished bulk is also in proportion to the diminished weight. With respect to the arrangement of the machinery in Mr. Gurney's carriage, the boiler is contained in the oblong, or boot, which we have described as placed in advance of

the carriage itself—one on either side the perch. Thus, all the ordinary parts of the vehicle, are left for the purposes to which they are usually applied in carriages—the interior, and the hind and fore dickies, for passengers; and the hind and fore boots for luggage, &c. But one of the principal novelties in this carriage, remains to be mentioned. In the various unsuccessful attempts, which have hitherto been made to use steam for the purpose of moving carriages along public roads, it has been the invariable practice, to apply the power exclusively to the wheels; and the consequence has been, that when any considerable resistance has been encountered, from extraordinary weight, rising of the road, &c., the wheels, having no hold of the ground, have not been able to overcome it. Now, in Mr. Gurney's carriage, the power can, when necessary, be applied, without any reference whatever to the wheels, and precisely in the same manner that locomotive power is applied on man, and other animals—namely, by means of propellers, or feet, placed underneath the carriage, and acted upon immediately by the steam machinery, when any extraordinary resistance presents itself. But though the propellers, or feet, of this carriage, are the most striking features belonging to it, the boiler strikes us, as being by far the most important; as that, if adequate to its purpose in the present instance, must be available in a vast variety of other ways, in which steam has not hitherto been applied, on account of the great weight and bulk of the boilers required to generate it.

A paragraph appeared in all the papers, stating that government has taken up Perkins's steam engine. This is incorrect; it is Mr. Gurney's locomotive engine and boiler, that the Admiralty have noticed, and have put the Comet steam vessel, at Deptford, under his care, for his experiments. The mistake arises thus: Mr. Gurney has recently taken possession of the factory, and premises, in which Mr. Perkins made the trial (which failed) of his steam gun, and is there prosecuting to completion, his engine, boiler, and steam coach, &c.

[*London Paper.*

Steam Engines.

Within the last twelve months, upwards of fifty patents have been taken out, in England and France, for steam engines; indeed, since the much-discussed improvement of Perkins, steam engine projectors seem to have run mad. The characters, or designations, of the new engines, have thus been rendered so multifarious, that it would be difficult to enumerate their nomenclature. We have atmospheric, hydraulic, pneumatic, and gaseous engines; on the respective merits of which, we presume not to decide, as they are chiefly known to the public, through the advertisements of their inventors; and we have not learnt, that any one of them is practically at work. From this sweeping clause, we are assured, that Mr. Gurney's engine and steam carriage may be excepted, as he has completely attained two grand objects; he has simplified the steam engine, to one-fifth of its com-

plex machinery, and he has rendered steam of 80 pounds to the inch, as safe as the boiling over of a tea kettle. These new engines will, it is further stated to us, cost about one-half the price of any of the others; a boiler on the new construction will weigh only 4 cwt., whereas on the old plan it would weigh 4 tons; and, by calculations made for the Board of Admiralty, it appears that the government steam-packet engines, with their charge of water, weigh 111 tons; whilst these to be put in use will not exceed 6 tons: that the space occupied by the present engines is 4600 cubic feet, and that the new ones will only occupy 600 feet; thus obtaining an advantage of 105 tons, and 4000 cubic feet space, for goods and passengers. Government has given up the *Comet* steam-packet to Mr. Gurney for an experiment, which, if relieved only one-half of the extent supposed, will confirm this to be one of the important discoveries of modern times. It may be added, that if this steam-engine boiler succeeds as expected, it will produce a new era in the art of dying, as steam-boilers, superior to any in use, will by its means be produced; it will only weigh a couple of hundred weight, may be placed on wheels, and moved about wherever it may be required: in fine, wherever water is wanted to be heated, or steam of a high temperature obtained in a few minutes, this boiler must always command a preference; and we suppose the patentees will find it their interest to manufacture it independent of the engine. [*ib.*

Burstall and Hill's Steam Carriage.

We have still delayed the publication of this invention (as of several others,) in the expectation of seeing something realized of which a satisfactory account might be given, but we have yet only the following to communicate, which is extracted from a letter of Mr. Burstall's received by us within these few days.

"Since we had the pleasure of your company at Leith, we have made many improvements, and at last are in a fair way to produce a complete machine. We have had much trouble with the boiler, and though we knew the last we made was very defective, yet we determined to make a trial, which took place in the night, ten days since; you will understand the difficulty we laboured under when I tell you, that our steam could not be kept up more than two minutes at a time, yet we got her, with care, to travel at the rate of full seven miles per hour, and as the steam by that time was getting very low, I am satisfied with a proper boiler, double that velocity will be quite easy.

"The steam makes no alarming noise, and as the coach will be better, for the roads, than the horse coaches, we are now sure of full success: Mr. Hill is in England, superintending the making a boiler, which will put us all right.

"My view is, that, it may be six weeks, or two months, before we shall be able to make our complete machine public."

[*London Journal of Science.*

Prize Chronometers.

The Lords Commissioners of the Admiralty, with a view of affording the utmost possible aid to navigation, and encouragement to the mechanic arts, have instituted two annual prizes, for the two best chronometers that could be produced, viz. £300 for the best, providing the error of its mean daily rate, when *doubled, added to the mean of its extreme variation, shall not exceed six seconds;* and £200 for the second best, providing its errors, on the same principle, shall not exceed *ten seconds*, after *twelve months'* trial at the Royal Observatory, Greenwich, each competitor being allowed to put in two; and from the Monthly Reports it appears that forty-eight were admitted on trial on the 1st of May, 1825. By the following official documents from the Royal Observatory, it appears that the two prizes have been awarded to Mr. J. M. French, Royal Exchange, his chronometers having far exceeded in accuracy any thing on record. The variation of No. $\frac{20}{3912}$, entitled to the first prize, having been only six tenths of a second in the twelve months on its mean daily rate; three tenths during the last nine months; and under one tenth of a second during the last four months of the trial; and No. 975, entitled to the second prize, varied less than a second during the twelve months.

They were the only two, within the limits of the first prize at the end of the trial.

This is a triumph alike honourable to the mechanic arts, and to the Government that appreciates them.

The Mean Daily Rates and Extreme Variations of Two Chronometers, by Mr. J. M. French, of the Royal Exchange, during their Trial at the Royal Observatory, from May 1, 1825, to May 1, 1826.

	No. $\frac{20}{3912}$		No. 975		Extreme of Temperature at noon.	
	Mean Daily Rate	Extreme Variation.	Mean Daily Rate.	Extreme Variation.		
	"	"	"	"	°	°
1825—May	4,75	1,3	2,71	1,4	66 to	54
June	4,30	1,7	2,54	1,5	75½—	54
July	4,14	1,6	1,93	2,8	82 —	63
August	4,43	1,4	2,30	0,9	76 —	63
September	4,50	0,9	2,36	1,1	74 —	60
October	4,65	1,2	2,79	1,4	64 —	45
November	4,57	1,2	2,92	1,6	55 —	39
December	4,36	1,4	2,51	1,9	53 —	36
1826—January	4,52	2,2	2,20	1,4	45 —	25
February	4,58	1,3	1,97	1,3	51 —	89
March	4,52	1,5	2,07	1,4	60 —	39
April	4,50	1,1	2,26	1,1	60 —	45

The two annual premiums of £300 and £200, have this year been awarded to Mr. J. M. French, for the above two chronometers.—Royal Observatory, May 12, 1826.

Royal Observatory, May 15, 1826.

"Sir—Having transmitted to my Lords Commissioners of the Admiralty a report of the merit of chronometers on the late trial, their Lordships have been pleased to approve of the two annual premiums of £300 and £200, being given for your chronometers, No. $\frac{1}{1012}$ and 975, and by your enclosing me a bill for the same, it will be forwarded for payment.

"I am, sir, your obedient servant, for *J. Pond*, Esq.

(Signed) THOMAS TAYLOR.

"Mr. J. M. French, Royal Exchange."

Canal through the Isthmus of Panama.

The government of Guatemala has granted to A. H. Palmer, esq. and others of the city of New York, the right to open a direct canal communication for ships, from the Atlantic, to the Pacific ocean, through the river San Juan, and the lake Nicaragua, with the privilege of an exclusive navigation for twenty years. This important grant was obtained recently, from the government of Guatemala, through the presence of col. Williams, our minister, by col. De Beneski, agent for the company, who arrived in this country early in the present month, after having accomplished his purpose: and who was recently in this city.

The whole extent of excavation, we are informed, will not exceed 17 miles (the distance between the lake and the river,) which will require a lockage of 200 feet. The work is required to be completed in 18 months, and it is said will be commenced with 6000 men from this country. An attempt will be made (and doubtless a successful one) to obtain an act of incorporation of the legislature of this state. The style of the company is the Atlantic and Pacific Ocean Company.

The agent of an English company was desirous to obtain the grant, or to participate in the advantage of it, and offered a large bonus for the privilege; but it is a source of gratification that the enterprise, skill and means of our own countrymen, have been charged with the execution of this truly great undertaking. It can scarcely fail to be a source of wealth to the company, and advantage to the whole commercial world.

The Boston Daily Advertiser, states that Col. De Beneski, wai'ed on the President, at Quincy, with despatches from our commercial agent at Guatemala, authenticating the intelligence communicated in the foregoing article. The government of Central America, called for proposals for such an undertaking about a year since, and several companies have been formed, it is said, in Europe for the purpose, and have presented their claims. The company with whom the contract is now made, are to have the right of toll, and certain exclusive

privileges, which the persons interested think of great value. It is supposed that the undertaking will receive countenance from the government of the United States. The persons now composing the company in New York, propose to extend it through all parts of the Union, making it as much as possible a national concern, and will apply to Congress, it is said, for incorporation, by the name of "THE CENTRAL AMERICAN AND UNITED STATES ATLANTIC AND PACIFIC JUNCTION CANAL COMPANY," with a capital of $5,000,000.— The undertakers are very sanguine as to the practicability of the scheme, and the profit of the speculation, as well as the national and commercial advantages to be derived from its execution. We understand they mean shortly to solicit the co-operation of our capitalists, and exhibit a detailed exposition of their views.

Protection of Ships in Storms.

Mr. Delafons, of George street, Hanover-square, has invented a machine, which, although very simple in its construction, is likely to prove more beneficial to society, than any similar discovery that has been made for many years. It is calculated to afford security against the possibility of ships being driven from their moorings in bad weather, and a certain protection against their going on shore, however violent the storm; a calamity that annually occasions the loss of numbers of lives, and of property to a great amount. The government are, we understand, in treaty with Mr. Delafons, for the purchase of this humane and useful discovery, for which he has taken out a patent.

List of Patents issued in the United States, from the 10th of May, to the 6th of June, and from the 21st of June, to the 31st of July, 1826.

Improvement in the combined lever cotton press, May 10, E. Venear, North Carolina.

In relieving water wheels from obstructions of back-water, May 10, Jare Benedict, New York.

In the machine for thrashing grain, May 10, John Shaw, Maine.

In covering, or platting, brick kilns, May 10, S. R. Bakewell, Virginia.

In the machine for excavating canals, &c., May 10, Lot Forrester, Connecticut.

In the method of forming schemes and tickets of lotteries, and for drawing the same, May 16, Edward Grattan, Rhode Island.

In boys' dresses, May 16, Charles Herwick, New York.

In sponges for artillery, May 16, John Gethen, Philadelphia.

In making cordage, May 17, E. Bartholomew, Boston.

In making chain cables, called the swedge hammer, May 17, E. Bartholomew, Boston.

In the art of manufacturing bread, May 18, E. Treadwell, New York.

In the mode of constructing water wheels and flumes, May 18, Asa Messer, Rhode Island.

In the circular saw, May 18, Wm. Kendall, jr. Maine.

In the family spinning machine, May 20, J. Watt, A. Prest, and G. Freeborn, Ohio.

In the machine for sawing felloes for wheels of carriages, &c. May 20, P. Collier, New York.

In the art of ornamenting walls, ceilings, &c. May 20, Wm. West, Philadelphia.

In furnaces for heating iron hoops for carriages, May 22, Garret Post, New York.

In pumping water for propelling machinery, May 22, Liscomb Knap, New York.

In the machine for raising water for domestic purposes, May 22, Liscomb Knap, New York.

In the press for pressing out cider, oil, and other liquids, May 20, Wm. H. Hoeg, Ohio.

In pressing Leghorn, straw, and other hats, May 23, R. Tyler and B. P. Coston, Philadelphia.

In the mode of loading carts, or wagons, with earth, May 23, Noah Osborn, Connecticut.

In the steam-packed rotary steam engine, May 25, S. Fairlamb and D. Bruce, jr. New York.

In the construction of saddles, May 27, Wm. H. Collins, Ohio.

In removing earth from canals by inclined rail-way, May 29, Wm. H. Doll, Pennsylvania.

In the machine for finishing or ironing fur, wool, or other hats, May 31, J. Cooper and T. Barnett, Philadelphia.

In the machine for removing earth, June 1, P. Reading, New Jersey.

In the construction of wind mills, June 1, Wm. Coburn, Maine.

In the lever press for packing cotton, and other articles, June 3, Charles Williams, Virginia.

In the thrashing machine, June 3, P. Reading, New Jersey.

In the thrashing machine, May 25, Seth Ballou, Maine.

In the springs to a wagon-seat, June 6, Walter Janes, Connecticut.

In the construction of rail ways, so that teams may pass each other on the same, June 6, J. Brown and G. W. Robinson, Rhode Island.

In relation to the evolution and management of heat, June 21, E. Nott, New York.

In the shaving and smoothing of wood, June 21, A. Brownson, New York.

In the machine for spinning flax and hemp, June 22, W. Hunt and W. Hoskins, New York.

In the buoyant dock, June 22, Maximin Isnard, New York.

In the machine for pressing unburnt brick and tile, at one operation, June 24, Ephraim Mayo, Maine.

In the machine for planting and working Indian corn, June 24, William Ross, Pennsylvania.

In cutting plugs for waists and decks of shipping, June 28, C. Josselyn, New York.

In the mode of sawing wood, slitting boards, and sawing felloes, by machinery, at one operation, June 24, B. Ruggles, Vermont.

In grist mills, June 29, Isaac Ryon, Massachusetts.

In the "Franklin Duplex Steam Generators," July 1, John M'Curdy, England.

In the 30 hour wooden wheeled clocks, July 5, Eli Terry, Connecticut.

In the washing machine, July 6, Seth Church, New York.

In the steering wheel, July 10, E. S. Coffin, Boston.

In steering vessels by the compound lever wheel, July 10, Rhodes Kinsbury and Edward Rowse, Maine.

In the braiding machine, July 10, John Thorp, Rhode Island.

In the scale for draughting garments of every variety of fashion and form, July 10, Nathan B. Starr, Philadelphia.

In the mode of preserving timber used in the construction of wooden locks for canals, July 10, Simeon Guilford, Pennsylvania.

In the cleave harrow for clearing swampy grounds, July 11, Lemuel Tam, Delaware.

In manufacturing salt by evaporation, and in heating liquids by the use of stoves and stove pipes immersed in cisterns, July 12, Stephen T. Conn, George-Town, Delaware.

In raising and removing earth, opening water courses, and making canals, July 14, Cyrus Barnard, Pennsylvania.

In making cartridges for blasting rocks, July 17, John B. Ives, Pennsylvania.

In the mode of letting water on water wheels, July 18, Thos. Key, Georgia.

In the steam generator, July 20, Stephen T. Conn, Georgetown, D. C.

In the mode of applying steam power to the sawing of timber, July 21, R. Nichols, New Orleans.

In spinning cotton and wool, July 24, Joseph Hathaway, New York.

In evaporating liquids, July 26, Charles Sholes, New York.

In the construction of grist mills for grinding Indian corn, &c. July 31, J. Northrop, Connecticut.

In the machine for grinding shelled corn, &c. July 31, J. Webster, Philadelphia.

List of New Patents, in England, which have passed the Great Seal, since June 22, 1826.

To Thomas Halahan, for Machinery or Apparatus for working Ordnance. Dated June 22, 1826.

To Lewis Aubrey, for an improvement or improvements in the Web or Wire for making paper. Dated July 4, 1826.

To John Poole, for certain improvements in Steam Engine Boilers, or Steam Generators, applicable also to the evaporation of Fluids. Dated July 4, 1826.

To Daniel Freeman, for improvements in measuring and making Collars for Horses and other Cattle. Dated July 4, 1826.

To Peter Groves, for certain improvements in manufacturing or making White Lead. Dated July 4, 1826.

To Robert Wornum, for certain improvements on Piano-fortes. Dated July 4, 1826.

To Peter Groves, for certain improvements in making Paint or Pigment, by preparing and combining a substance or material with Oil, Turpentine or other ingredients. Dated July 10, 1826.

To Benjamin Lowe, for certain improvements in useful and ornamental Dressing Pins. Dated July 14, 1826.

To John Guy and Jacob Harrison, for an improved method of preparing Straw and Grass to be used in the manufacture of Hats and Bonnets. Dated July 14, 1826.

To John Palmer De Lafons, and William Littlewort, for an improvement in securing or Mooring Ships, and other Floating Bodies, and Apparatus for performing the same. Dated July 14, 1826.

To Edward Bayliffe, for certain improvements in the machinery used for the operation of Drawing, Roving, and Spinning of Sheep and Lambs' Wool. Dated July 14, 1826.

To John Lane Higgins, for certain improvements in the construction of Cat-blocks and Fish-hooks, and in the application thereof. Dated July 14, 1826.

NOTICES.

Lectures at the Franklin Institute.

The new Hall of the Institute, will be opened for the season, on Monday, the 6th of November, on which occasion, an address will be delivered by Dr. Patterson.

The introductory lecture, of the Professor of Mechanics, will be delivered on the 7th, and Dr. Bache's lecture, introductory to his course of chemistry, and its application to the arts, on the 9th of the same month. The hour of lecturing will be half past seven o'clock in the evening.

Saturdays are reserved for volunteer lectures.

A member's ticket, which costs but THREE DOLLARS PER ANNUM, will give admission to all the lectures; and a ticket, for the season, admitting a member's son, or apprentice, may be procured for ONE DOLLAR.

☞ The evening schools, for Drawing, and for Mathematics, commence with the present month.

LECTURES ON CHEMISTRY.

DR. THOMAS P. JONES, will deliver a course of lectures on chemistry, at the Hall of the Franklin Institute, during the ensuing winter.

The general principles of the science, and their application in accounting for many of the phenomena of nature, and a variety of processes in the arts, will be familiarly explained, and illustrated by numerous and brilliant experiments, for which purpose Dr. J. has the command of an extensive apparatus.

Tickets, admitting a lady and gentleman to the course, 12 dollars,
Tickets for a gentleman only, 8 dollars.

The lectures will be delivered at 7 o'clock, in the evening. Further particulars will be made known by advertisement in the public papers.

TO SUBSCRIBERS.

Those who have not paid their subscription for the year, are reminded that it is due. Those who do not pay before the commencement of the next volume, will be considered as having relinquished the work, as it is determined not to allow two years' subscription to become due from any individual. New subscribers, residing in the country, where there is no regular agent, must remit the amount of a years' subscription, at the time of subscribing; in which case, the latitude of a second year will be allowed for their next remittance.

Belidor, came to hand, just as the present number was finished. We have seen the engine in New York, to which he refers. We shall publish some remarks upon the subject in our next, together with B.'s communication.